PIMM

INCLUDING
DIE CASTINGS
MAGAZINE

MARCH
1955

devoted exclusively to:

DIE CASTINGS

INVESTMENT CASTINGS

ERMANENT MOLD CASTINGS

PLASTER MOLD CASTINGS

POWDER METALLURGY

SHELL MOLD CASTINGS

Precision Metal Molding

Just released: first product standards for die casting design – page 29

Aluminum or Zinc Alloys

that always help you get better quality castings and trouble-free production

Aluminum ALLOYS

- All ingot produced for die casting, permanent mold and sand casting requirements have superior working characteristics and are free from impurities and gas.
- Composition is constantly checked during production to assure ingot meets your specifications.
- Orders are promptly processed and shipped with certificate of analysis.
- Shipments are palletized for fast, efficient handling.

Zamak ZINC BASE DIE CASTING ALLOYS

- All ingot is quality controlled during production to insure uniform quality metal.
- All alloys to your specifications.
- All shipments are palletized and shipped with a certificate of analysis.
- Deliveries are promptly made to meet your production schedule.

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DIE SET-UP

Easier! Faster! Safer!...

WITH

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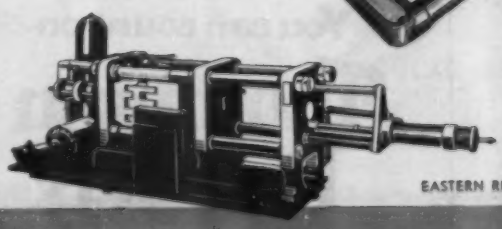
DIE-CASTING MACHINE

Built-in Rack and Pinion permits use of a ratchet wrench to quickly move the complete die-locking assembly in place to accommodate various sizes of dies.

Die-Lock Valve can be shut off and by-passed, with Inching Valve assuring added safety when setting up die. This permits instantaneous, micromatic control.



Faster set-up time is just one of the many "bonus" features which make Cast-Master today's outstanding choice in die-casting machines. To get the complete "bonus" story, send for the Cast-Master catalog, containing illustrations and specifications on eight new models.

SEND FOR CATALOG TODAY!

EASTERN REPRESENTATIVE: Milton Harmon, 18 Rock Road, Milford, Connecticut

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THOMPSON ENGINEERS LIGHT METAL CASTINGS

FOR ALL INDUSTRY

Versatility today keynotes more and more the operations at Thompson Products Light Metals Division. Light, strong, durable metal castings are constantly being engineered, designed, developed and produced by Thompson's exacting engineers for a wide range of customer uses.

A background of over 50 years in research and manufacture of precision metal parts enables Thompson to offer aid to all forms of industry. Today it is producing light metal castings for such diversified products as aircraft and washing machines; buses and garbage disposers; tractors and outboard motors; automobiles and industrial engines.

Regardless of your product, if you use castings, Thompson's creative engineers will gladly show you where and how you can simplify your operations and save on costs with Thompson's Light Metal Castings.

Write or phone Light Metals Division, Thompson Products, Inc., 2269 Ashland Rd., Cleveland 3, Ohio.

AIRCRAFT
A carbon pile regulator —a high pressure aluminum die casting.

APPLIANCES
A garbage disposer housing—one of several permanent mold castings Thompson makes for garbage disposer units.

AIRCRAFT
An alternator housing used on jet aircraft engines.

APPLIANCES
Die cast motor end frames used on appliance and industrial electric motors.

For a detailed description of the Thompson Light Metals Division operations, send for your free copy of "Creative Castings". "Steel Belted Pistons", detailing this Thompson development, is also available. Just write, on your company stationery, to Dept.PM-4, Light Metals Division, Thompson Products, Inc., 2269 Ashland Road, Cleveland 3, Ohio.

You can count on

Thompson Products

LIGHT METALS DIVISION

2269 Ashland Road Cleveland 3, Ohio

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pmm

March 1955

Volume 13 Number 3

precision metal molding

DIE CASTINGS
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PLASTER MOLD CASTINGS
PERMANENT MOLD CASTINGS
POWDER METALLURGY
SHELL MOLD CASTINGS

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AJAXOMATIC

AN AUTOMATIC POURING UNIT FOR THE PRODUCTION OF ALUMINUM DIE CASTINGS.

What AJAXOMATIC does for the Aluminum Die Caster:

(1) It pours the exact amount of metal at exactly the right temperature.

(2) Metal pours as a broad stream without turbulence.

(3) Pouring starts as soon as the die is closed. Each machine cycle can be completely automatic.

(4) Time loss, fatigue, and human error of traditional hand ladling are eliminated.

THE RESULT:

INCREASED PRODUCTION, CONSISTENT QUALITY, HAPPIER WORKERS.

AJAX ENGINEERING CORPORATION

TRENTON, N. J.

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We never know when he's going to drop in!

...we don't need to know

Every member of the *Certified Zinc Alloy Plan* knows that several times a year, unannounced, a field representative will call to pick up a few samples, selected at random from a regular production run, for testing. This is done wholly for *your* protection. For the producer to retain his license and the right to use the *Quality Certification Seal*, every one of the samples must test "on grade" in the Plan's approved and unbiased testing laboratories.

This periodic inspection has required no change in Mount Vernon's methods of precision die casting. We have always held it to be ordinary good business to produce die castings of absolutely top quality. And the growing list of American industrial firms who have continued to come to us for die castings for 5, 10, and even 20 years, seems to us sound evidence that this policy pays.

When you buy zinc die castings, you'll be *sure* if you insist on the seal which shows that they are CERTIFIED ZINC die Castings.

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Let's look at the facts about die casting metals

Most people claim aluminum and zinc die cast alloys are pretty much the same wherever you buy them. Maybe. But that's not the point.

You want more than the *product* when you buy metal. You want *service* from your supplier.

Federated service gives you:

1. Research, constantly working to give you a new and better metal.
2. Practical Help, in your shop, by field experts whenever you have a metal problem.
3. Fast Deliveries; 14 plants across the country.
4. Metal Variety; any die casting alloy you need, aluminum, zinc or magnesium.

Try Federated metal-plus-service. It's the best metal plus the extra of competent technical help with your problems.

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VACUUM METALLIZING

Your article "Vacuum Coating Sparks Sales" pages 51 and 52 January issue has caused quite a bit of comment among the users of vacuum metallized stampings and zinc die cast parts.

On page 52, you state that your product can be vacuum coated if it does not require resistance to abrasion or corrosion in use. The entire success of the vacuum metallizing process depends upon the synthetic resins which are used as protective coatings over the vacuum metallized film. Recent tests have shown that the properly vacuum metallized part will withstand 250 hours of salt spray and 800 hours of 100% humidity. Also, the motor industry has recently investigated vacuum metallizing in lieu of electroplating for the interior trim of cars. Abrasion tests using a standard Tabor Abrasor with a 500 gram weight showed that a vacuum metallized film will withstand more abrasion than conventional copper-chrome plating. There is every indication that many manufacturers will swing over to vacuum plating for interior trim during the forthcoming year, and extensive tests are underway which indicate that vacuum metallizing will also be used for exterior plating.

Recent developments in synthetic resins have accounted for the tremendous increase in vacuum coating on zinc die castings and steel stampings. In fact, one such coating will withstand drilling, punching, forming and severe impact without disrupting the film. We thought it would be advisable if you could point out these facts to your readers in order to eliminate any possibility of a misunderstanding as indicated in your article. — J.G.S. (Manager)

Kindly furnish me the names and addresses of several Die Casting firms who also do plating or vacuum coating, preferably located not farther than 100 miles from N.Y.C.

Continued on page 8

NOW . . . fire-resistant hydraulic fluids at the viscosities you need—

Celanese* CELLULUBE*

SAYBOLT SECONDS @ 100° F.

90 150 220

The new Cellulube series of fire-resistant hydraulic fluids — in 3 viscosity ranges — clears the way for many new applications.

In addition to fire resistance and excellent lubricity, Cellulube hydraulic fluids have the following advantages:

- non-corrosive
- low volatility
- controlled viscosity
- thermal stability
- non-foaming
- high boiling point

In the die-casting field, Cellulube 150 and 220 are already standard hydraulic fluids. Now Cellulubes find applications in . . .

furnace combustion controls in steel mills and oil refineries . . . coke ovens, furnace tilters, loaders and ingot carriers . . . electrical welders, extrusion presses, forging and multiple action presses.

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Chemical Division, Dept. 589-C
180 Madison Avenue, New York 16.

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HYDRAULIC FLUIDS SPECIALLY ENGINEERED FOR SPECIFIC APPLICATIONS

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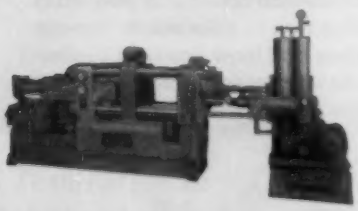
HOW TO GET SOUND DIE CASTINGS

NEW H-P-M Mechanical Clamp Assures Positive Die Locking

Here's why H-P-M's new die casting machine makes better castings: new positive clamping action is achieved by sliding wedges driven by knuckle-joint linkage which preloads the press frame and backs up the platen. The results . . . a minimum of flash . . . sound castings.

In this new H-P-M clamp mechanism there are no toggle pins under heavy shear load . . . no single line contacts . . . and no extremely high stressed members that normally result in high maintenance cost and down time.

These are just a few of the 40 new and improved features of the new H-P-M die casting machine. Write for Bulletin 5400, a completely illustrated story on this H-P-M line of profit makers.



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1094 Marion Road

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HPM

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LETTERS TO THE EDITOR
continued from page 6

Also kindly furnish me the address of the Vacumet, Inc., Chicago, Ill. — N.H.

DIE CASTING PROCESS

In your issue of December you have an article "The Die Casting Process". We think this covers the subject much better than any that we have seen and we wish to congratulate you.

We think so much of it that we would like to spread the good news to those a little less informed on the subject than we are.

Would you please inform us if you have tear sheets of this article available? — R.A.C.

Tear sheets have been sent.— Ed.

SOURCES

We are interested in locating a commercial metal molding company to mold aluminum rotor bars and end rings in rotor laminations to be supplied by us.

Some of our people saw an advertisement for such a company sometime ago and were of the opinion that it appeared in Precision Metal Molding. We are therefore wondering if you have any suggestions to offer us. — W.B.E. (Purchasing Agent).

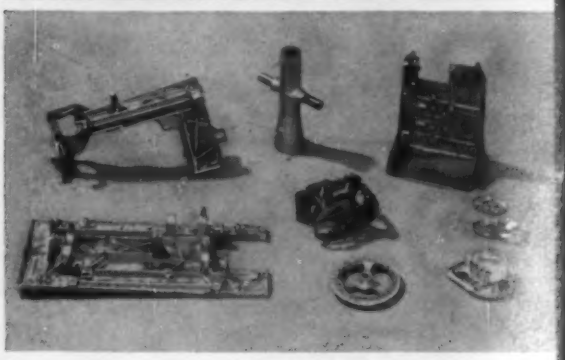
We are interested in the possibilities of producing molds using powdered metal cavities for use in molding rubber and plastic parts.

Please advise proper sources for these cavities and industries which are using them. — R.K.S. (Engineering Department).

Can you send me the names of some reliable Foundries in New England or the Northeastern area of the United States who produce high quality plaster mold castings on a jobbing basis? — G. J. (Supervisor of Patterns).

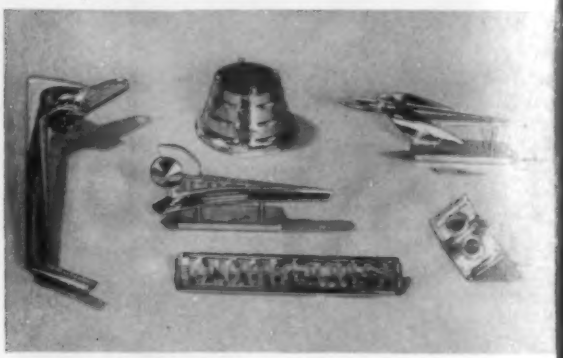
Names of sources and related information concerning these processes have been forwarded. — Ed.

You Can LOWER COSTS with PRECISION DIE CASTINGS



REDESIGN PARTS FOR MORE ECONOMY

Parts formerly produced by other methods can be redesigned for low-cost die casting. Even present die castings may be redesigned for more economical production.



DIE CASTINGS FOR FUNCTIONAL PARTS

More and more functional parts are now being die cast at great savings. Today's modern alloys plus Precision's design and engineering skills combine to produce rigid, strong, accurate functional die castings.

COMBINE PARTS INTO ONE DIE CASTING

Substantial savings in production costs can often be realized by combining several parts into one Precision die casting. You save not only on the cost of the parts but also assembly costs are eliminated.

FINISHING COSTS ARE LOW

Precision die castings can be painted, oxidized, plated or self-finished by polishing. Precision has complete facilities for finishing die castings.

Call a PRECISION Engineer, Today!

*Since 1909 the name "PRECISION" has been the symbol of highest quality in the die casting industry

PRECISION CASTINGS CO., Inc.

212 Walnut St., Fayetteville, N. Y.

Syracuse, N. Y. · Cleveland, O. · Chicago, Ill.
Kalamazoo, Mich. · Cortland, N. Y.

British Affiliation — Wolverhampton Die Casting Co., Wolverhampton, England

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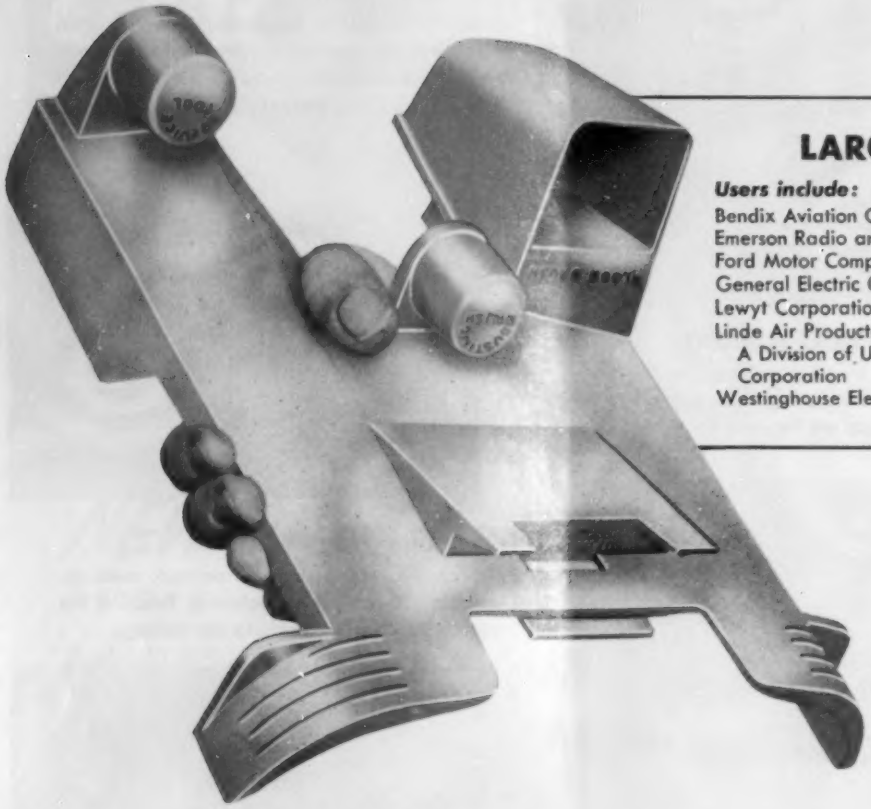
Many Leading Manufacturers Specify

DOLLIN ZINC AND ALUMINUM DIE-CASTINGS



LARGE PARTS

Users include:

Bendix Aviation Corp.
Emerson Radio and Phonograph Corp.
Ford Motor Company
General Electric Company
Lewyt Corporation
Linde Air Products Co.
A Division of Union Carbide and Carbon Corporation
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SMALL PARTS

Users include: Chevrolet-Central Office • International Business Machines Corp. • Radio Corporation of America • Sargent & Company • United Specialties Company, Mitchell Division • The Eagle-Picher Company • Argus Cameras, Incorporated

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Sales Offices: Boston • Buffalo • Canton • Charlotte • Chicago • Detroit • Louisville • Philadelphia • Pittsburgh • St. Louis • St. Paul

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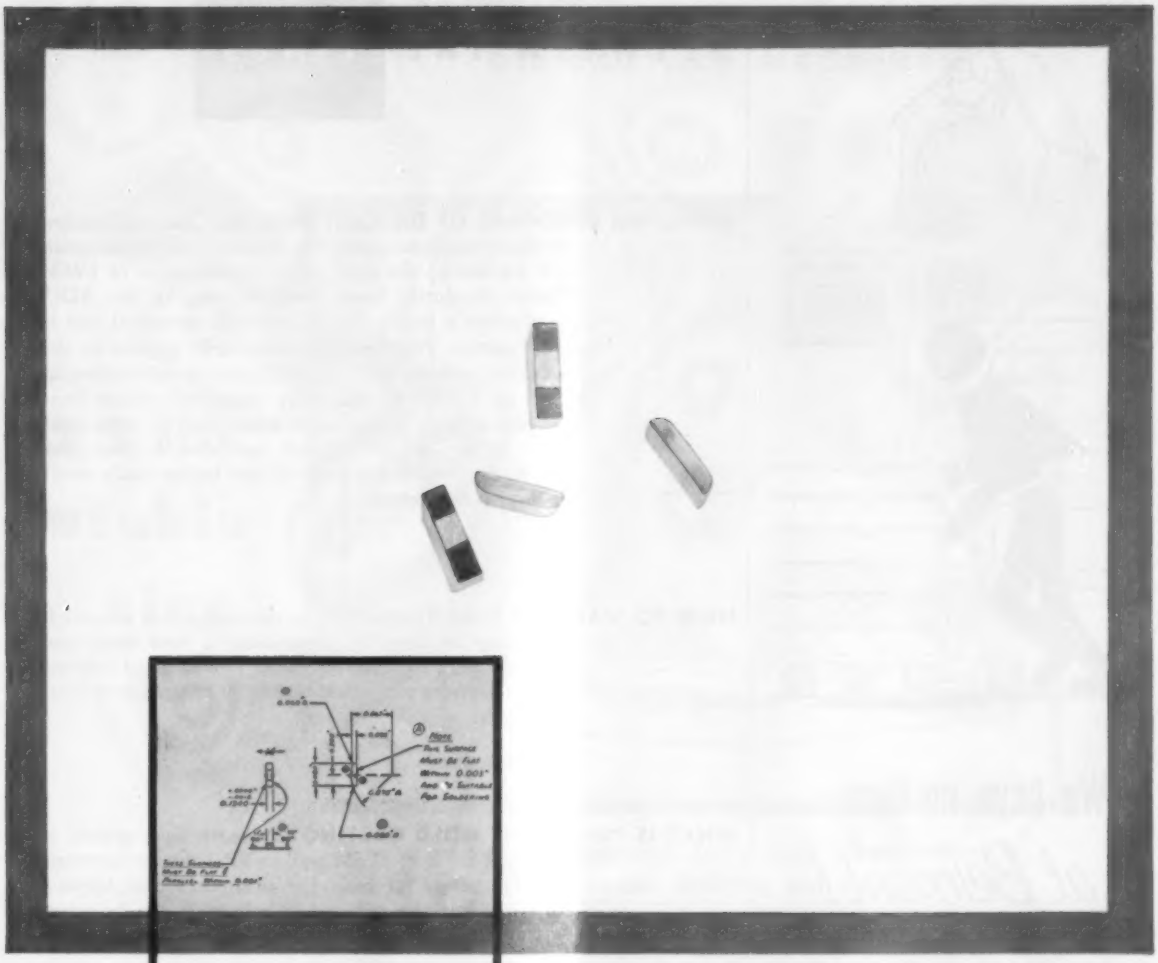

accurate dimensions of ACCUMET PRECISION INVESTMENT CASTINGS mean improved uniformity . . . lower cost

A manufacturer of hearing aids, using magnets in the form of sand-cast bars, found grinding and cutoff costs excessive . . . dimensional control difficult . . . breakage high.

Crucible engineers suggested producing the magnets to close tolerances by *Accumet® Precision Investment Casting*, using a special patented Crucible Alnico grade. Results? Costly finishing operations were almost entirely eliminated, and magnetic properties improved. The manufacturer got a *better magnet at a lower cost.*

When you have a product requiring close tolerance, quality parts of any size, be sure to consider the advantages of Accumet Precision Castings. They are also available in stainless, alloy and cobalt-nickel base grades. Your nearby Crucible representative can show you how they cut production time . . . save you money. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 30, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

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We have no time...
at Belmont!

Once your order is in – OUR TIME IS YOURS. For here at Belmont every order is "rush" ...goes right into production for earliest possible delivery. A full crew stands ready at all times to serve you.

Now, with expanded facilities and up-to-the-minute equipment, the Belmont team will supply the usual Belmont quality–faster than ever before!

Don't specify "rush" – specify "Belmont"!

Belmont
SMELTING & REFINING WORKS, INC.
307 BELMONT AVENUE • BROOKLYN 7, NEW YORK
"Putting Mettle into Metals Since 1896"

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BETWEEN THE LINES

GUIDE FOR DESIGNERS OF DIE CASTINGS, the first die casting product standards, are offered as an aid to designers and buyers of die cast parts in this issue of PMM. These standards have been drawn up by ADCI to provide a guide for the most economical use of die castings. The first two standards appear in this issue and others will be published in successive issues of PMM. So far, five standards have been approved, with three more scheduled by mid-year. Eight others are scheduled for later in the year. Extra copies of the standards are being made available without charge.

HOW TO MACHINE PURE TUNGSTEN is the subject of an article beginning on page 58, describing a new technique reported here for the first time. It will be of interest to all designers who need precision components from this metal.

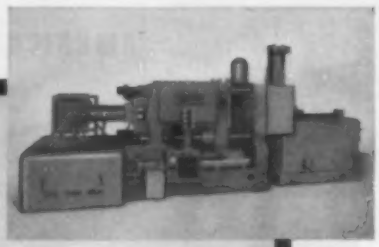
WHAT IS PERMANENT MOLD CASTING? A basic facts article in the April issue of PMM will outline the background of this casting process for designers and buyers, explain what the process is, where it can be used, and what its range of applications is.

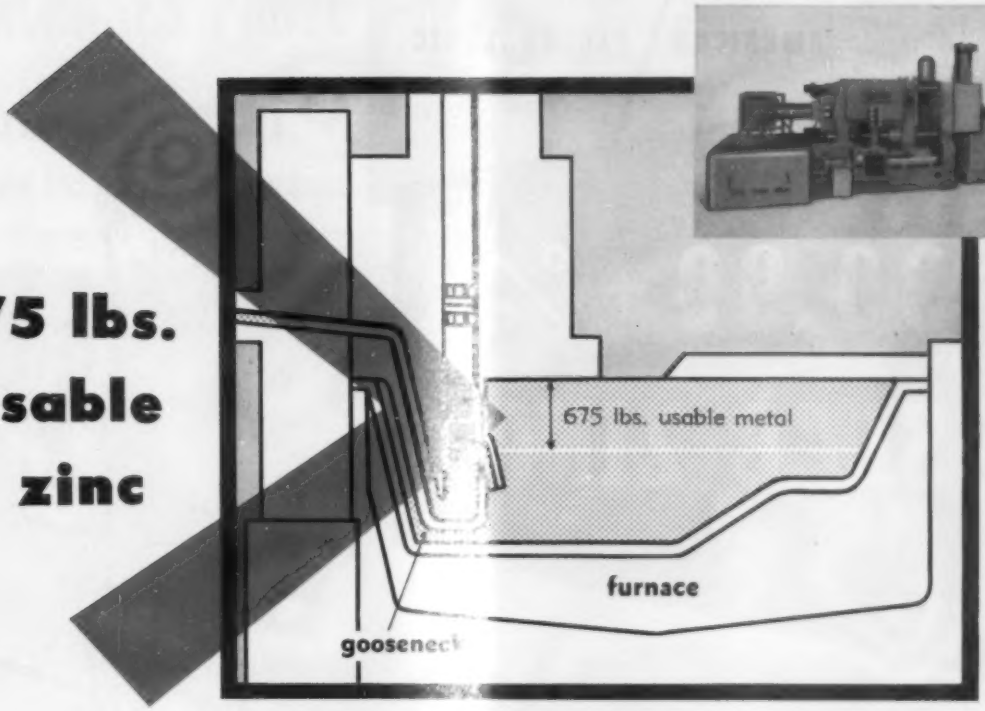
BUYERS OF INVESTMENT CASTINGS should understand the influence of quantities and shapes of parts upon the cost of tooling and the choice of pattern materials. A review of this subject, including a chart of tool costs, begins on page 32.

BUYING DIE CASTINGS BY EAR might be the title of an article scheduled for PMM describing the use of magnesium die castings for their sound damping properties. This application of magnesium in musical equipment suggests study of this metal for other equipment where sound needs to be deadened.

YOU CAN SAVE MONEY by reclaiming the fire-resistant hydraulic fluid used in your die casting machines. A diagram of the system being used by one die caster to compensate for the high initial cost of this fluid is contained in an article beginning on page 79.

REED-PRENTICE
DIE CASTING MACHINES





675 lbs. usable zinc

NEW gooseneck & furnace arrangement increases melting pot capacity

Re-designed Gooseneck and Furnace increase melting pot capacity to 1700 lbs. of zinc on the REED-PRENTICE #2 die caster; to 1150 lbs. of zinc on the #1½ model.

This new design provides 675 lbs. of usable metal above the liner port, gives more efficient production these ways:

1 - pot life lengthened by elimination of stress points;
2 - permits longer operation without re-fill;
3 - requires less of operator's time and attention.

A quick-change plunger coupling is incorporated for easy adjustment of Gooseneck, plunger and nozzle. Entire furnace assembly can be lowered quickly to use lower die plate hole.

CAPACITIES

Machine	lbs. Zinc/shot	Melting Pot (with Gooseneck in Place)
#1½	15	1150 lbs.
#2	17½	1700 lbs.

free

Complete information on REED-PRENTICE die casting machines. Write for your copy.

REED-PRENTICE CORP.

WORCESTER 4, MASSACHUSETTS
Affiliate of **PACKAGE MACHINERY COMPANY**

REPRESENTATIVES: Houston—Steel & Machine Tool Sales Co.; Seattle & Spokane—Star Machinery Co.; Minneapolis—Chas. W. Stone Co.; Los Angeles—Western Molders Supply Co.

BRANCH OFFICES: 75 West St., New York 6, N. Y.; 1213 West 3rd St., Cleveland 13, Ohio; 4001 N. Elston Ave., Chicago 18, Illinois; 2842 W. Grand Blvd., Detroit 2, Michigan.

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for Quality Production

AMERICAN ELECTROLYTIC

99.99+% SLAB ZINC

A reliable source for die casting requirements

AMERICAN ZINC SALES COMPANY

Distributors for

American Zinc, Lead & Smelting Company

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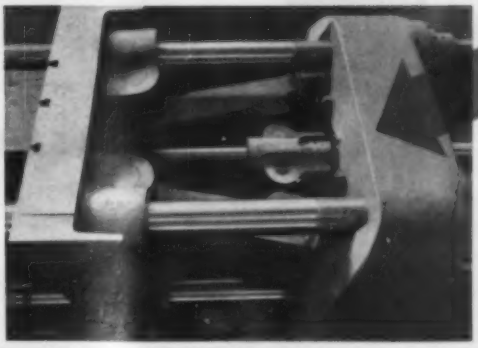
REPETITIVE PURCHASES PROVE SUPERIORITY

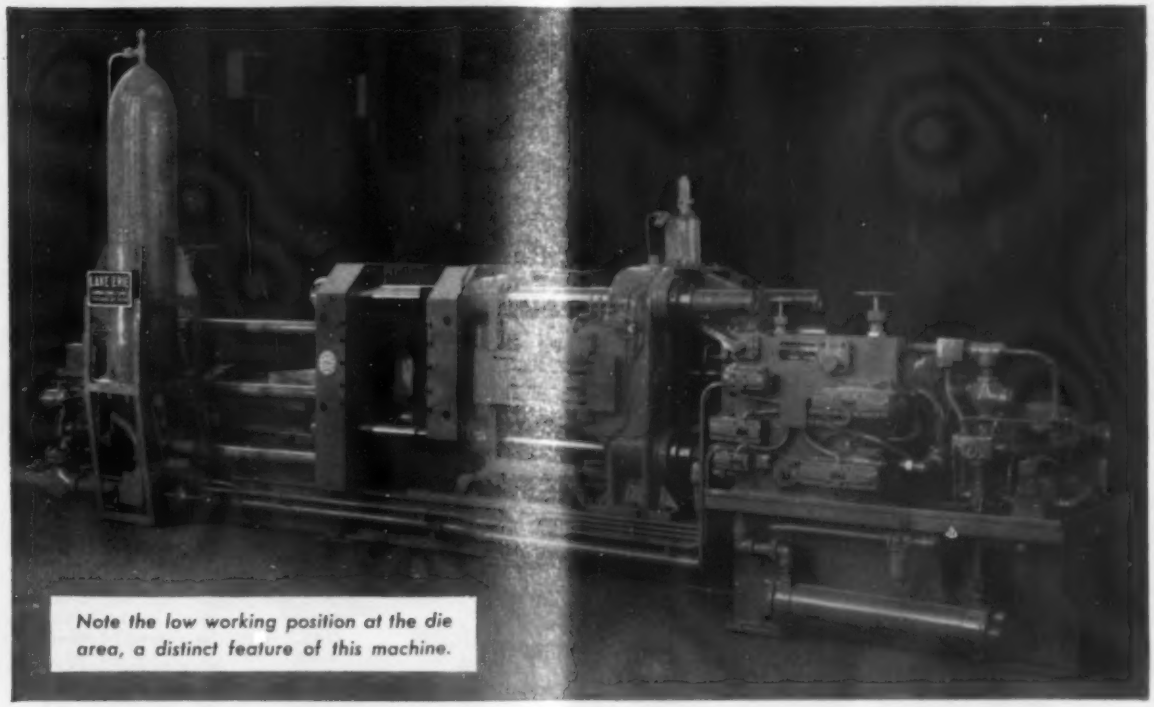
of Lake Erie Die Casting Machines



The Wedge Cam Toggle is a self-compensating clamp that *automatically* takes up clearances in the dies due to contraction and expansion of the molds during production or shut-down periods.

Pressure-Pac is a patented automatic pressure booster that produces sounder castings by feeding the shrink or compressing the porosity at the time of solidification of the metal.

● *Over 40 Lake Erie Die Casting Machines are now in service at The Electric Auto-Lite Company's plants.*



Note the low working position at the die area, a distinct feature of this machine.

Lake Erie die casting machines bring you features long desired but never before available in die casting equipment. The patented "Wedge Cam Toggle" and "Pressure-Pac" injection unit are the first major improvements in die casting equipment in many years. Repetitive purchases of these machines by companies like The Electric Auto-Lite Company, Ternstedt Division of General Motors and others assure you that Lake Erie equipment has no equal for quantity or quality of die castings. (Ask us about the new 16mm film describing Lake Erie machines.)

TYPICAL USERS of Lake Erie Die Casting Machines

Allis-Chalmers Mfg. Co.
Bendix Aviation Corp.
Bohn Aluminum & Brass Corp.
Central Die Casting & Mfg. Corp.
Davidson Mfg. Co.
The Dow Chemical Co.
Eclipse Machine Div. (Bendix)
The Electric Auto-Lite Co.
General Controls
General Electric Co.
General Motors—Ternstedt Div.
Hunter Fan & Ventilating Co.
Johnson Motors
Kiekhaefer Corp.
Ludman Corp.
McCulloch Motors Corp.
Outboard Marine & Mfg. Co., Ltd.
Rupert Die Casting Co.
Superior Die Casting Co.
Westinghouse Electric Corp.

WRITE *for Bulletin 23.2 — Contains Machine Specifications, Pressures, Capacities, Speeds, etc.*

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HYDRAULIC PRESSES • DIE CASTING MACHINES
ROLLING MILL AUXILIARY EQUIPMENT

For more information circle No. 37 on the Reader Service Card

DATA OFFERED IN THIS MONTH'S ADS

to get any of the free materials described here, circle the appropriate number on the reader service cards bound into this issue

2. DIE LUBRICANTS. The applications of colloidal dispersions of graphite and molybdenum disulfide as die casting lubricants are discussed in Reprint DC and Bulletin 426-X10. Both are available from Acheson Colloids Co.

6. ALUMINUM CASTING ALLOY. An aluminum casting alloy that is said to have superior casting properties, mechanical properties and which is more economical to use is described in a brochure from Apex Smelting Co.

7. PISTON RINGS. Full information, prices and sizes of piston rings for all types and sizes of die casting machines is available from the Auto Diesel Piston Ring Co.

10. CASTING ALLOY SPECS. Full specifications, both chemical and physical, as well as the mechanical properties of the as-cast metal are given in the Master-Met Bulletin from Cannon-Muskegon Co.

11. DIE CASTING CATALOG. A catalog describing the complete line of Cast-Master die casting machines and accessories for them is now available.

12. FIRE RESISTANT hydraulic fluids are fully described and their properties given in technical data available from the Celanese Corp. of America.

13. INVESTMENT CASTING equipment and supplies are listed and described in bulletin No. 1202 available from the Centrifugal Casting Supply Co.

14. HOT OR COLD CHAMBER die casting machines embodying all of the most recent design advances are described in Bulletin No. 50 from Cleveland Automatic Machine Co.

20. BLACKEN ZINC & COPPER castings with one of the Ebonols. Complete technical data on the various materials available, their properties and methods of use can be secured from Enthone, Inc.

25. TINY DIE CASTINGS in zinc are described and illustrated in the new bulletin that has been published by the Gries Reproducer Co.

26. COST CUTTING with plaster mold castings. A new booklet from the Hale Foundry Co. describes how plaster mold castings may be able to cut costs drastically.

27. ZINC BASE die casting alloys, properties, applications, and general die casting news make up the contents of the monthly bulletin "The Henning Messenger". It is available from Henning Bros. & Smith, Inc.

28. INVESTMENT . . . FOR ECONOMY . . . for performance is the title and subject matter of a new booklet that has been issued by the Hitchiner Manufacturing Co., Inc.

29. "HOOVER DIE CASTINGS" an informative booklet by the Hoover Co. is being distributed.

30. DIE CASTING MACHINES. A complete catalog of the line of die casting machines and accessories made by Hydraulic Press Mfg. Co. is available.

31. PRECISION INVESTMENT CASTINGS by International Nickel Co. are described and the savings that they make possible are given in a 16 page booklet, Cast to Outlast.

33. POWER PRESS OPERATIONS can be done more easily and more economically on a Johnson press. Specification bulletin 1955 describes 20 models built by Johnson Machine & Press Co.

34. MELTING FURNACES for investment casting. A direct casting furnace with the mold attached to the furnace is described in a new bulletin on Type IC furnaces from Kuhlman Electric Co.

35. DIE CASTING MACHINES for making more and better castings are described and illustrated in a new catalog available from the Kux Machine Co.

36. DESIGN INFORMATION on die castings is contained in literature available from Litemetal Dicast, Inc.

37. DIE CASTING machine specifications, pressures, capacities, speeds, etc. are given in Bulletin 23.2 from Lake Erie Engineering Co.

39. METAL ALLOY POWDERS by the hydride process have solved many tough production problems. Technical data from Metal Hydrides, Inc. is available. It gives full particulars of available materials.

43. CUT COSTS with plaster mold castings. A brochure from Ohio Precision Casting Co. gives a number of interesting case histories.

47. PINIONS, GEARS & RACKS for die casting and permanent mold casting machines are listed and described in information available from Peerless Gear and Machine Co.

49. DIE CASTING MACHINES by Reed-Prentice Corp. are fully described and production information given in a new catalog that has just been published.

53. LADLES FOR DIE CASTING are described and the full range of available sizes listed in a bulletin from Spincraft, Inc.

56. SILICA FOR INVESTMENT casting investment material is available in many standard grades. A listing from Tamms Industries, Inc. gives sizes, grades, and prices.

57. "CREATIVE CASTINGS" is the title of a booklet from Thompson Products Co., Light Metals Div. describing the advantages and uses of die castings.

58. CASTING, MACHINING, FINISHING are the services offered by the Tri-State Die Casting Corp. Their catalog gives the services available in detail.

60. MANUAL ON BURNISHING materials. How to choose the proper material and the proper shape are discussed in the Abbott Ball Co. catalog-manual.

61. PROTECTING ALUMINUM. Allied Research Products, Inc. has technical reports available on Iridite No. 14-2, a protective coating for aluminum.

62. BARREL FINISHING. A new catalog is available from Almco Supersheen on barrel finishing, equipment, and materials.

63. SPRAY PAINTING WITH MASKS. Free literature is available on masks, fixtures, mask washing machines and automatic spraying machines from Conforming Matrix Corp.

64. FINISHING DIE CASTINGS. The facilities of the Four Plating Co. for polishing, rato finishing, and plating of zinc and aluminum die castings are described in a brochure.

65. FINISHING BY TUMBLING. A complete catalog of tumble finishing machines and materials is available from Grav-i-Flo Corp.

66. THREADED INSERTS. Self tapping threaded inserts that retain their grip on the metal and provide firm anchorage for machine screws, bolts, etc. are described in the Groov-Pin Corp. catalog.

Continued on page 26

for small die castings . . .

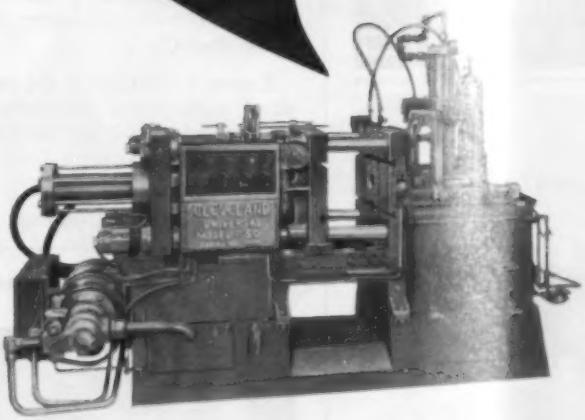
you'll get profitable production from this fast, efficient, low cost

CLEVELAND
Model 50

For small die cast parts, you can depend upon the Cleveland Model 50 Universal Hydraulic Die Casting Machine to give you *profitable* production — on high volume runs or short runs where the die investment can be low.

Very economically priced, the Cleveland Model 50 is designed and engineered to provide every essential to insure precision-quality castings at a high rate of speed. The Model 50 will free cycle at over 1000 times per hour. Tie bars, toggle links, pins, platens are of extra-heavy, rigid construction. Automatic electric timing of the cycle is a part of the standard control system. Hydraulic controls are provided for core pulls. High injection speed and pressures assure sound, dense, *"hardware"* finish castings.

Detailed information on these and many other Cleveland-quality features is given in Bulletin No. 50, which also describes the next size larger, Model 100, Cleveland Die Casting Machine. Write for your copy today. Better still, arrange now to discuss your die casting machine requirements with the Cleveland Automatic Sales Engineer in your area. There is no obligation.



Cleveland Model 50 Universal Hydraulic Die Casting Machine. Converts from zinc, tin or lead casting to aluminum, brass or magnesium casting by simply changing the hot-metal shot end. Size of die plates: 18¾" x 22". 50-tons locking pressure. Similar in construction to machine shown above is the Cleveland Model 100 Die Casting Machine which has 22½" x 24½" die plates, 100-tons locking pressure.

Write for Bulletin 50

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4952 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
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HARTFORD • S. ORANGE

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

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For more information circle No. 52 on the Reader Service Card

STROH

Has Been Producing Excellent ZINC DIE CASTINGS Since 1903

We are a bit proud of the fact that numerous of our customers are in the third generation.

"Teddy" Roosevelt was president of the United States when STROH first produced zinc die castings. The fact that we still serve many of these early accounts, we believe, speaks volumes for the excellence of our product.

Inquiries Invited:

STROH DIE MOULDED CASTING CO.
525 East Michigan St., Milwaukee, Wisconsin

aluminum . . .
- permanent mold castings
- die castings

EASTERN CASTING CORP. DIVISION
THE EASTERN MALLEABLE IRON CO.
64 South William Street, Newburgh, New York

For more information circle No. 18 on the Reader Service Card

Louis Sirotkin has been appointed as metals buyer for *Bohn Aluminum & Brass Corp.*

C. W. Weiland has been named purchasing director of *Fasco Industries, Inc.*

Wilbur Nixon has resigned from the *Federated Metals Div. American Smelting & Refining Co.*

George H. Starmann, Jr. has been appointed assistant sales manager of *Apex Smelting Co.*

Arthur J. Gervais has been named the new assistant manager of sales for *International Minerals & Metals Corp.*

Arthur E. Stehle is the new national sales manager for *Ettco Tool Co.*

Ernest E. George is the new plant manager of the permanent magnet plant for the *Carboloy Dept. of General Electric Co.*

Continued on page 24

ACHESON COLLOIDS HONORS GEORGE F. WILLSON

George F. Willson, well known in the metal working and lubrication fields, is shown holding an engraved wrist watch presented by **M. W. Reynolds,** general manager, *Acheson Colloids Company,* at a testimonial dinner on the occasion of his retirement. Mr. Willson joined the Acheson family in 1917, and has represented Acheson Colloids in Ohio for more than a quarter of a century.

GRADE A DESIGNING with MADISON-KIPP ZINC and ALUMINUM DIE CASTINGS

Any mechanic can see at a glance that grade "A" designing is involved by both the principal and the die designer in the part illustrated.

Please note the steel shaft insert, the metal savers, the half round sections, the holes and the special shape all assembled in one shot of the die casting machine.

The seasoned and skilled craftsmen at Madison-Kipp may be able to assist you with your unusual design requirements. They will be glad to try.

kipp

MADISON-KIPP CORPORATION
213 WAUBESA STREET • MADISON 10, WIS., U.S.A.

• Skilled in Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools

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Blacken

copper, zinc, steel

the SURE way with . . . ENTHONE

Ebonols*

Enthone, with years of experience, has accumulated a storehouse of information on the right way to blacken metals. This knowledge is always available to our customers through our Service Department.

EBONOL "S" Processes for blackening steel to produce jet-black oxide coatings. Simple and economical to operate. Operating temperatures: EBONOL "S", 285-290°F., EBONOL "S-30", 295-305°F.

EBONOL "C" The quality black for copper and brass that meets all military specifications.

EBONOL "Z" A durable, deep, rich finish for zinc plate or zinc alloy castings. Dull or glossy oxide black coatings are formed in from 5 to 10 minutes at 140-180°F.

EBONOL "Z-80" A blackening process for zinc and zinc base alloys. Operates at room temperature.

WRITE US FOR ANY NEEDED INFORMATION OR ADVICE ON ANY BLACKENING PROBLEMS

*REG. TRADEMARK

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1300 Parsons Court, Rocky River, Ohio

L. H. BUTCHER COMPANY
3628 East Olympic Blvd., Los Angeles 23, California

For more information circle No. 20 on the Reader Service Card

CASTING ABOUT

A BETTER SALES CURVE. Although business in general in 1954 was off somewhat from 1953, the use of iron powder in the United States showed a healthy upward trend . . . total domestic and foreign shipments to U.S. consumers was up to more than 35 million pounds, which is almost 35% better than 1953. Figures are from the Metal Powder Association.

ALUMINUM SMELTING IN THE DAKOTAS? At the head of the list among suggested users of power from the vast lignite-brown coal deposits in North Dakota (about 12% of recoverable fuel resources in the U.S.) is aluminum smelting. Study by Arthur D. Little, Inc. to help industrial development in that region lists major power-consuming industries that might use power from the brown coal.

MACHINIST'S HAMMER. A soft-faced, non-marking machinist's hammer of a specially-developed aluminum-magnesium alloy is reported by Wellman Bronze & Aluminum, who cast the hammer in a single piece for Little Beaver Industries. Good strength, accurate center of gravity for balancing and freedom from chipping are features.

USES FOR METALLIZING. Three announcements of new ways to use vacuum-deposited aluminum have been received: an aluminum-coated fabric for protective garments in industrial "hot" jobs such as foundries; metallic appearing, pressure-sensitive adhesive tape for industrial marking and labeling; metallized fabrics with embossed patterns for car interiors. The first two are from Minnesota Mining & Mfg., the other from duPont.

100 VACUUM FURNACES. With the shipment of the 100th commercial-sized vacuum furnace by National Research Corp. recently (marked by elaborate ceremonies) attention focuses on increasing range for uses for vacuum furnaces to produce metals and alloys for such products as bearings, jet engine turbine blading, electronic tubes, magnetic alloys and sintered cutting tools.

SOLUTION CERAMICS. A new type of ceramic coating that establishes a molecular bond with the surface on which it is deposited, may have uses in die casting and other metal casting plants. Developed by Armour Research Foundation of Illinois Tech, it may be useful in crucibles, holding ladles, die casting reservoirs, metal pumps. Half-inch stainless steel bolts, coated by this method, were cast into aluminum, brass and automotive cast iron. The bolts could then be backed out of the holes, leaving cleanly threaded blind holes.

AN "H"-SHAPED CROSS SECTION and other shapes normally difficult-to-press by powder metallurgy will become possible with the delivery of a 300-ton hydraulic powdered metal press which United States Graphite Co., Div. of Wickes Corp., has ordered from Baldwin-Lima-Hamilton Corp. Double-action top punch, floating die platen, shuttle-type feeder, independently floating core rod are among the features.

MORE COPPER CYANIDE FOR PLATERS. With the announcement of new, large-scale production of copper cyanide by Copper Pigment and Chemical Works, Inc., a second domestic source of this vital plating chemical now becomes available to U. S. platers.

Continued on page 23

WHERE DIE-CASTING and SAND-CASTING FAILED

EP Co

AN INVESTMENT CASTING *Succeeded!*

Weld Pocket for Lamp Industry

INVESTMENT CASTINGS IN ANY CASTABLE ALLOY EXCEPT MAGNESIUM.

1/8" slot cast to .125 + .002 inches to make a snug fit for .124 bar which passes full length of 4" long slot.

Originally die-cast of Aluminum, this vital part failed because of lack of strength. Sand-casting in Bronze was equally unsatisfactory because shape of part made necessary machining difficult and costly.

When EPCO "know-how" was utilized, the part was investment cast in high tensile Brass . . . machining was eliminated and a stronger, better part was the result.

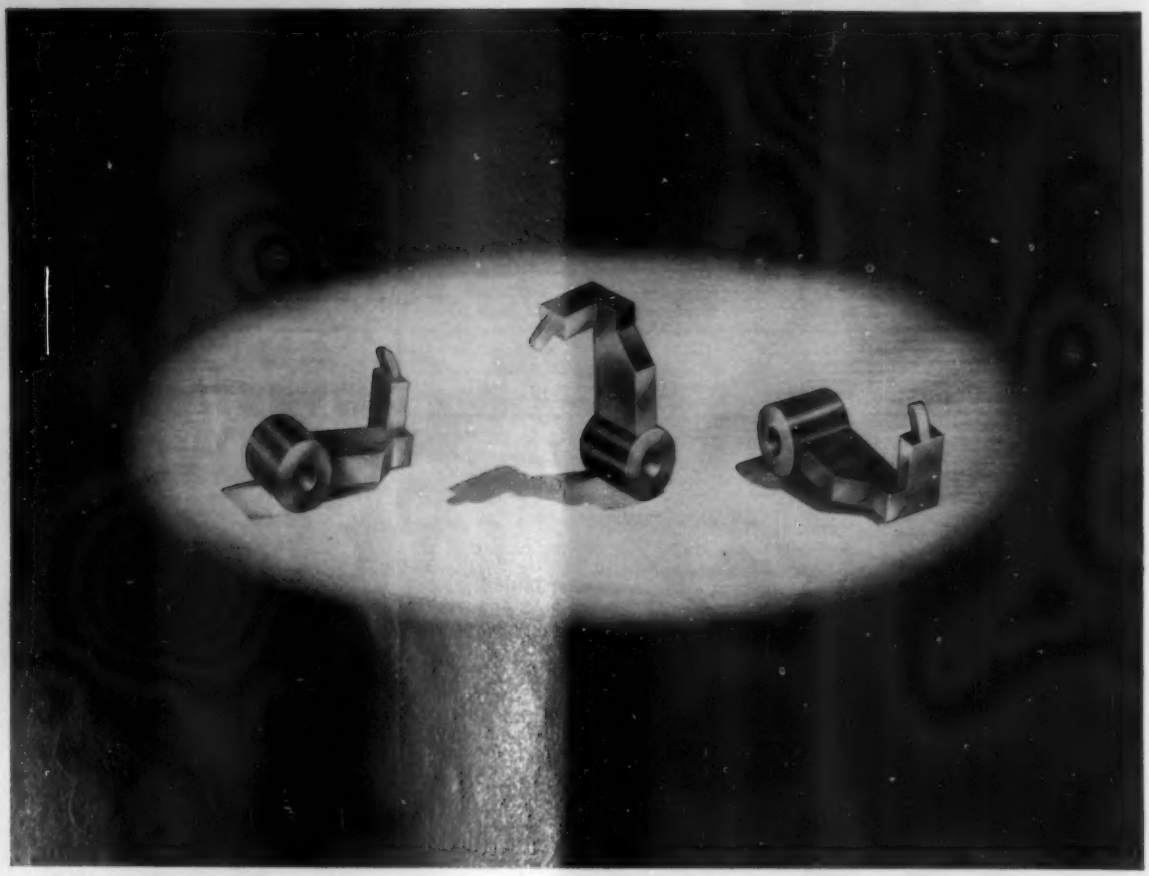
Send Us Your Drawings For Quotations On Parts Where EXTRA QUALITY Must Be Maintained.

EP Co

ENGINEERED PRECISION CASTING CO.

FREEHOLD RD.
MATAWAN, N. J.

circle No. 21 on the Reader Service Card



Impossible in Powdered Metal?
Not at PARKER

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SALES ENGINEERS

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Ollie J. Berger Company • 2059 East 72 Street

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Daniel F. Marsh • 35 Chestnut Street

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Edward P. Higgins, Jr. • 102 West Adams Street

WILTON, Conn.
Girard L. Palmer • Belden Hill Road

SYRACUSE, N. Y.
J. C. Palmer • 712 State Tower Bldg.

BELLEFONTE, Penna.
Warren G. Olson • 420 East Linn Street

This part—with projections in several planes, not to mention an I.D.-O.D. section—looked like an impossible job for powdered metal. Yet Parker made it in **one press operation**—complete—to close tolerances and tight "specs"—at relatively **low cost.**

This unusual piece points up the advantages offered by Parker powdered metal processing. Tough cost problems of conventional casting and machining methods often can be solved. Tensile strength, ductility and impact resistance can be closely controlled to meet rigid specifications. Powdered metal constituents can be precisely and uniformly blended for a wide range of requirements.

Parker's experience and facilities in producing a wide variety of powdered metal parts have saved money—and solved problems—for many users. Your problem may be one that Parker can solve in like manner. Just call the nearest Parker sales engineer listed at the left.

Parker White Metal Company • 2153 McKinley Ave., Erie, Pa.

PARKER

POWDERED METAL PARTS
ALUMINUM and ZINC
die castings

For more information circle No. 46 on the Reader Service Card

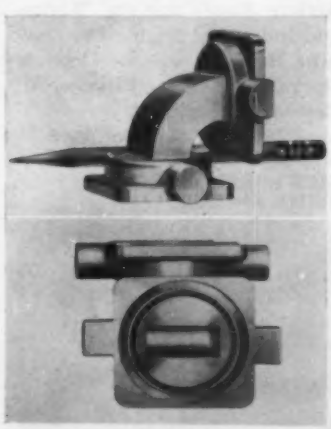
CASTING ABOUT
continued from page 21

WEIGHED NOT GUESSED. Instead of estimating the weight of molten metal being poured, Washington Mould, Machine and Foundry Co. now has a Dillon dynamometer hooked in series between the crane hook and the ladle. Closer control of alloy additions is one reported advantage.

ALL-MAGNESIUM AIRCRAFT. An experimental all-mag airplane (F-80C), the first to be flight-tested, took to the air at Mitchell Field during February. Research and development leading to the 100% magnesium plane started before WW II when aluminum became scarce.

NEWCOMER TO PRECISION casting techniques is one called "the Ellis process", now being used by Howard Foundry Co. for such jobs as microwave plumbing. Said to be a combination of plaster mold and investment casting techniques, the foundry reports as-cast finishes "ranging from 10 to 20 microinches" and guarantees production castings with "a maximum of 30 microinches".

The Ellis process, invented by J. S. Ellis, a physicist, has patents pending. Ellis microwave castings are said to be dense and pass 100% X-ray an Zyglo inspection which is important because microwave systems are filled with inert gas under pressure.



So far, alloys cast by this new process are beryllium copper and aluminum alloys such as 356, principal material used in microwave plumbing.

Variations in tolerances, Howard says, are held to ± .0015, with some deviations as low as .00005 obtained in the as-cast state.

NEW!

HIGH SPEED
A.B.C. DIE CASTING
MACHINE

Free Cycles Over 1000 Shots Per Hour

Here's the new A·B·C high speed, low cost die casting machine which eliminates costly production of small die castings on large die casting machines. Air operated, the machine produces small non-porous lead, tin and zinc alloy precision die castings up to 1½ lbs. The A·B·C is economical to operate and easy to set up. Its lightning production speeds makes single cavity molds practical and profitable.

STANDARD EQUIPMENT INCLUDES:
- 4 TIE BARS
- AUTOMATIC TIMING
- CALIBRATED TEMPERATURE GAS CONTROL
- GAS BURNERS
- DIE BLOCKS
- AIR REGULATOR
- FILTER
- OILER
- SAFETY SHOT INTERLOCK

Write today for engineering data and prices. Ask for bulletin A-10.

A B C

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339 W. 112th PLACE • CHICAGO 28, ILLINOIS

Die Castings by MILWAUKEE

...for Extra Values at No Extra Cost!

A pioneer in its field, Milwaukee offers you the experience and knowledge gained in helping others for more than 40 years, to realize the full benefits of the die casting process. In its modern plant, it offers you the most advanced facilities for the production of zinc and aluminum die castings. These extra values which cost you no more, can help you build extra values into your product, too.

We operate under the Certified Zinc Plan of the American Die Casting Institute, Inc.

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For Alloy Powder Combinations?

If you need a specific alloy combination to fill a specific requirement, the Metallurgical Division of Metal Hydrides can help you. With seventeen years of pioneering with metal powder alloys, Metal Hydrides' Metallurgists can give you unmatched know-how assistance plus volume production of alloy combinations that meet your exact requirements. Metal Hydrides' alloy powders are clean, uniform in composition, and controlled in particle size to assure desired results.

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20 CONGRESS STREET, BEVERLY, MASS.

For more information circle No. 39 on the Reader Service Card

NAMES IN NEWS
continued from page 18

S. Sydney Minault has been appointed general manager of the *Equipment Div. of National Research Corp.*

The *Celanese Corp. of America* has announced two promotions in sales. **Edward F. Swanezy** is now sales manager of the Chicago district and **M. Henry Jamison** is sales manager for the newly established district sales office in St. Louis, Mo.

Fred Peterson Co. has been appointed as midwestern sales representative for *Bacon Industries, Inc.*

G. C. Mitchell has been appointed staff executive of *Chrysler Corp.'s* Central Purchasing Dept.

Dr. Kurt C. Frisch is the new assistant manager of research of *E. F. Houghton & Co.*

New purchasing agents for the various divisions of the *Chrysler Corp.* are: **Wesley G. Embury** for Plymouth Div., **Donald W. Matzen** for Desoto, **John F. Bowes** for Chrysler Div., **Stephen J. Roach** for Dodge Truck, **Kenneth E. Chamberlin** for MoPar Div., **Arthur Fields** for the Marine and Industrial Engine Div., **Arthur H. Hilverkus** for Defense Operations Div., and **Horace M. Coy** for Airtemp Div.

Continued on page 26

JACK HANNEY HONORED BY UNITED CHROMIUM

Jack Hanney, a former president of the Grand Rapids Branch of the A.E.S., was recently honored by his co-workers at *United Chromium.* The occasion was Mr. Hanney's 10th anniversary as a sales and service engineer with the company.

"Prohibitively Expensive"
...until Inco precision cast it

"How in the world do you expect me to machine this?" asked the chief machinist as he held up this tiny part to examine it more closely. "It's hard enough to cut glass!"

"That's right, George," said the engineer. "It's got a Brinell of 600."

"It'll cost a small fortune if I machine these out of bar stock. Why has it got to be so darn hard?"

"Because if we make this stem tip out of the metal we regularly use in our valves, it won't give the required service," said the engineer. "You see, George, this is the only metal we've found that won't gall and score in our valves when they're handling raw crude oil and hydrogen sulfide at 6,000 psi and 525°F."

"But we'll go broke machining them," said George, shaking his head.

"That's the good news," said the engineer. "International Nickel is going to precision cast them for us. When you get these stem tips they'll be just like the one you're holding there."

"Why didn't you say so? There'll be nothing to it then," said George. "All this needs is a little smoothing before we mount it on the stem."

That is why Kerotest Manufacturing Company has Inco precision cast the stem tips for their needle valves when they are to be used in extremely corrosive service.

How to cut costs with INCO *precision casting*

Wherever you have a part which is 6 inches x 5 inches or smaller, weighs under 3 lbs., requires starting tolerances as close as plus or minus .005 inch per linear inch, and needs 5 or more fabrication steps, there's a good chance you can save by having it precision cast.

5 Advantages of INCO *Precision Castings*

- Save up to 60% of production costs.
- Longer life with harder alloys.
- Little or no machining required.
- Wider design latitude.
- Higher alloys at lower cost.

INCO precision casts most high-melting-point metals from carbon steel to the new super alloys.

Here's help for you

If you have a cost problem with a small part, send for the new 16-page booklet on Inco casting that's just out. It's called *Cast to Outlast*. And it gives you actual case histories of the success others have had with Inco precision castings. Successes like Kerotest's . . . successes in a wide number of fields that may suggest how you can cut your costs with Inco precision castings.

The INTERNATIONAL NICKEL COMPANY, Inc.
67 Wall Street — New York 5, N. Y.

INCO TRADE MARK

Inco Castings *Precision, Sand, Centrifugal*

For more information circle No. 31 on the Reader Service Card

BETTER PRECISION CASTINGS
with IC direct cast furnace

This new direct-casting Detroit Electric Furnace produces better precision castings in less time. Fast, indirect arc melting plus direct furnace-to-mold casting cuts production cycle to as little as 7 minutes.

Uniform melts bring lowest reject rate, increase over-all efficiency. Low power consumption, high utilization of heat for operating economy. Get full information on Type IC Detroit Electric Furnace for higher precision casting production.

Write today for full information on Type IC Detroit Electric Furnace.

Type IC Furnace with mold attached.

FEMA

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KUHLMAN ELECTRIC COMPANY
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GRC ZINC ALLOY THREADED
FASTENINGS
mean to you...

in terms of a better product
in terms of a more economical product!

Every Quality Feature is an Economy Feature!

- The plain bright finish does not require further surface finishing for most applications
- Closer tolerances • Cleaner threads • Greater dependability, durability • Die-cast uniformity.
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GRC — *World's Foremost Producer of Small Die Castings*

For more information circle No. 73 on the Reader Service Card

REFERENCE DATA
continued from page 16

24. LUBRICATING DIES for die casting and forging are among the subjects covered in technical bulletins offered by Fiske Brothers Refining Co. Die casting die lubricant is suitable for both zinc and aluminum.

75. ETHYL SILICATE for investment casting is covered in technical literature offered by R. W. Greeff on behalf of Montrose Chemical Co.

71. FINISHING DIES with fine mesh, liquid-carried abrasives is described, and equipment illustrated, in a bulletin from Pangborn Corp.

18. TOLERANCES FOR PERMANENT MOLD and die castings are included in an informative brochure offered by Eastern Casting Corp., producers of both types of aluminum castings.

NAMES IN THE NEWS
continued from page 24

J. Joseph Kelly has been appointed sales manager of *Reed-Prentice Corp.*, according to an announcement from the company.

George Bennethum has been appointed assistant manager of tool steel sales for *The Carpenter Steel Co.*

Three appointments have been announced by the *Celanese Corp. of America*. **Robert J. Davis** has been made supervisor of the new Sales Development Group, **Howard L. Pilat** is now supervisor of the New Chemical Development Group; and **Winthrop M. Barnes** is supervisor of Market Research. In addition, **Howard G. Zbornik** is project leader of the functional fluids group.

Harry Lee Sennett has joined *Allied Research Products, Inc.* as sales engineer.

M. W. Reynolds has been appointed general manager of *Acheson Colloids Co.*, and **P. C. Buck** has been appointed to take charge of engineering and production for *Acheson Industries, Inc.*

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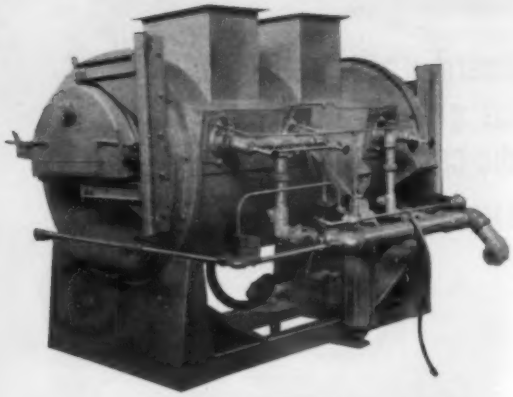
Another Stroman 1st



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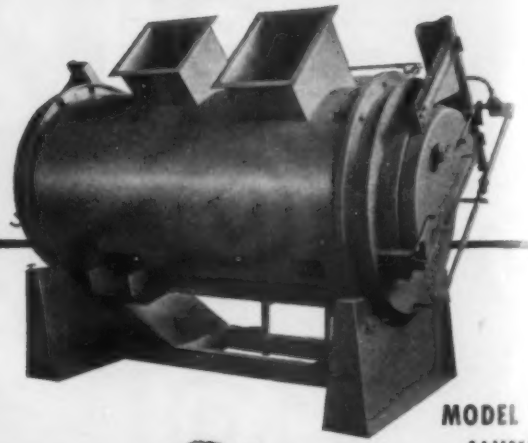

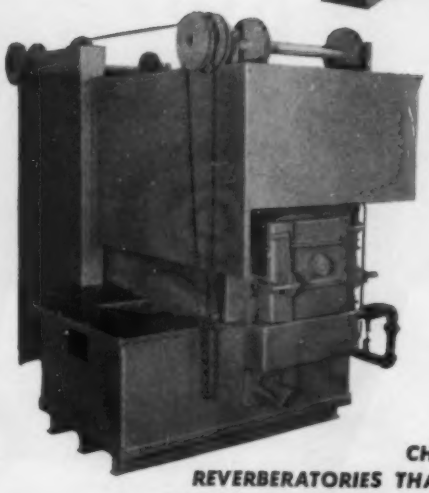

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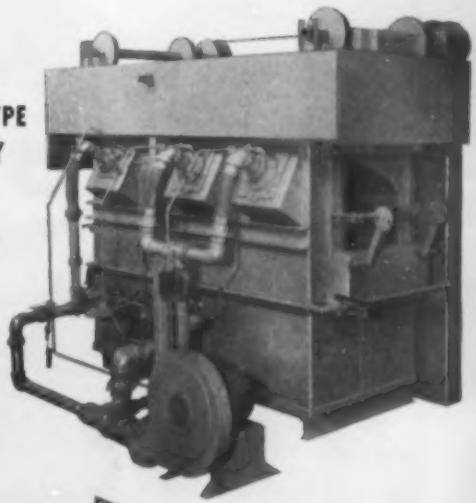

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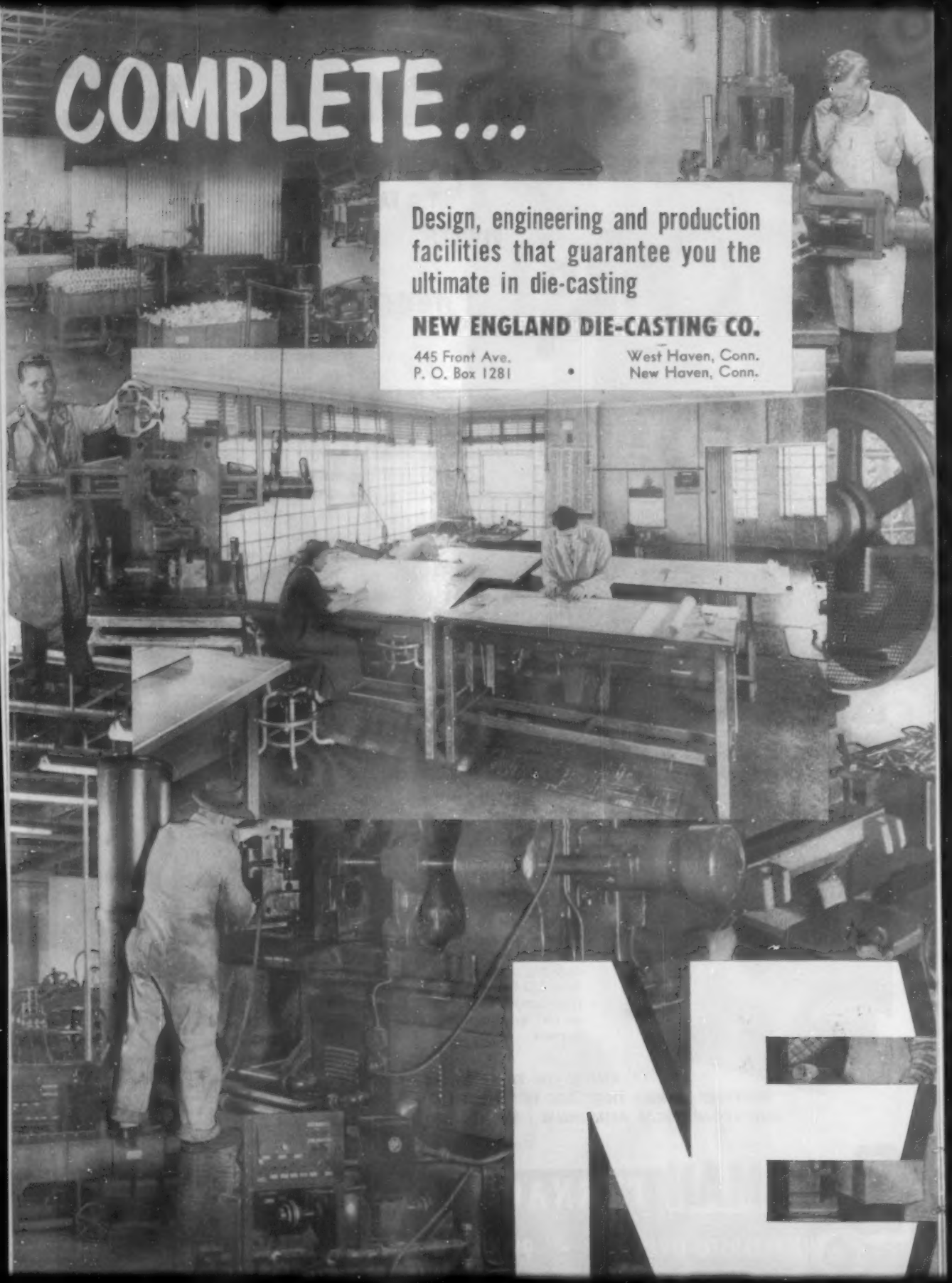
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Product Standards For Die Castings

Here, for the first time, are design standards to help the engineer and buyer get the most for their die casting dollars . . .

PRODUCT designers now have, for the first time, a yardstick to help them in designing die castings for greatest economy. The first five of a long series of product Standards have now been announced by the American Die Casting Institute, national organization of jobbing die casters, and are presented here for the first time.

The most economical and efficient use of die castings depends upon the designer's recognition of normal commercial practices in order to avoid "overspecification."

The Product Standards Program will comprise three series of recommendations when completed. The Engineering Series is announced with the release of the first five design recommendations. The Metallurgical Series and a series on Commercial Practices, both in the writing stage at present, will be distributed as they become available, to users by job shop die casters.

David Laine, Secretary of ADCI, commenting on this new program, said: "These standards are being developed to serve as a guide to the most economical use of die castings. Experience of our member die casters has shown that many customers tend to overspecify their die castings — that is, they demand more critical tolerances or conditions than the application requires."

Mr. Laine explained that many design engineers, aware of the capabilities of the die casting process, have no guide to effective utilization of the potential of the process. Created to assist in specifying realistically, these Standards present design values consistent with high speed uninterrupted production, reasonable die and tool life and maintenance costs, normal inspection, packing and shipping costs.

By conforming to these Standards, designers can procure die castings on the most economical basis. Critical requirements should be specified only where necessary and, Mr. Laine further explained, "these requirements may be simplified if the design engineer consults the die caster early in the design stage."

The first two of the five Standards now released are published on the following pages, with the balance to be published in successive issues of PMM. Three Moving Die Part Tolerances; more are to be issued by ADCI in July, with seven others for later publication. Altogether, there will be about 40 Standards covering three general subjects: Engineering Product Standards, Metallurgy and Commercial Practices, to be designated as Series "E", "M" and "C" respectively.

Standards already released include: Linear Dimension Tolerances; Parting Line Tolerances; Draft Requirements for Walls; and Flatness Tolerances.

Scheduled for July are: Depth of Cored Holes; Draft Requirements For Cored Holes; and Cored Holes For Tapping.

Now being studied by ADCI members for later release are Standards for: Die Cast Threads; Fillets, Ribs and Corners; Trimming; Ejector Pin Marks; Alignment; Concentricity; Machining Stock Allowances; and Lettering, Engraving & Honeycomb Design.

When the entire series of Standards is completed, it will be collated into one volume. Standards will be numbered serially and bear the prefix letter of the proper series (E, M or C). Thus, ADCI-E1-55T indicates Institute Tentative Engineering Standard #1 issued (or revised) in 1955.

Commenting on the new standards, Walter M. Goldhamer, vice president of Superior Die Casting Co., said, "This study has made possible the defining of tolerances, materials and practices within which the die casting process produces most efficiently. These product standards are not intended to specify limits of performance, as do other types of standards in industrial use. The ADCI Product Standards indicate only the most efficient, hence the most economic levels of performance for the die casting process."

Tolerances for linear and parting line dimensions are printed on the following pages. Other standards will appear in future issues of PMM.

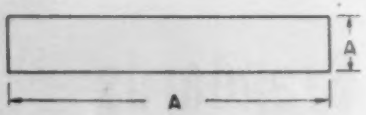
Additional copies of the Standards are available without charge. If you want a set, drop a request to the editor, PMM, and we'll forward it to the ADCI.

PRODUCT STANDARDS FOR DIE CASTINGS

ADCI-E1-55T
LINEAR DIMENSION TOLERANCES

NOTE—The values shown herein represent normal production practice at the most economic level. Greater accuracy involving extra close work or care in production should be specified only when and where necessary since additional cost may be involved.

LINEAR DIMENSION TOLERANCES, AS CAST.



The tolerance on a dimension "A" will be the value shown in the table. This tolerance must be increased where the parting line of the die, or moving die parts, affect dimension "A". (See Standard E2 and E3)

TOLERANCES FOR CRITICAL DIMENSIONS (THREE PLACE DECIMALS) IN INCHES

Length of Dimension "A"		DIE CASTING ALLOY			
		ZINC	ALUMINUM	MAGNESIUM	COPPER
Basic Tolerance up to 1"		± .003	± .004	± .004	± .007
Additional Tolerance for each additional inch of Dim. "A"	Over 1" to 12"	± .001	± .0015	± .0015	± .002
	Over 12"	± .001	± .001	± .001	XX

EXAMPLE: An aluminum die casting would have on a 4.000" Dimension "A" a tolerance of ± .0085" if that dimension is not affected by a parting line or moving die part.

TOLERANCES FOR NON CRITICAL DIMENSIONS (FRACTIONAL OR TWO PLACE DECIMALS) IN INCHES

Length of Dimension "A"		DIE CASTING ALLOY			
		ZINC	ALUMINUM	MAGNESIUM	COPPER
Basic Tolerance up to 1"		± .010	± .010	± .010	± .014
Additional Tolerance for each additional inch of Dim. "A"	Over 1" to 12"	± .0015	± .002	± .002	± .003
	Over 12"	± .001	± .001	± .001	XX

NOTE: The tolerances shown above must be modified if a parting line or moving die part affects Dimension "A".

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366 Madison Avenue New York 17, New York

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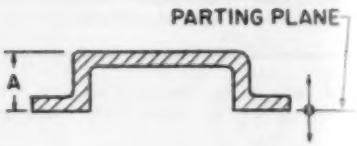
PRODUCT STANDARDS FOR DIE CASTINGS

ADCI-E2-55T
PARTING LINE TOLERANCES

NOTE—The values shown herein represent normal production practice at the most economic level. Greater accuracy involving extra close work or care in production should be specified only when and where necessary since additional cost may be involved.

PARTING LINE TOLERANCES — IN ADDITION TO LINEAR DIMENSION TOLERANCES
(BASED ON SINGLE CAVITY DIE)



Parting Line Tolerances, in addition to Linear Dimension Tolerances, must be provided when the parting line affects a linear dimension.

"Projected Area" is the area of the die casting in square inches at the die parting plane.

ADDITION TOLERANCES IN INCHES				
Projected Area of Die Casting.	DIE CASTING ALLOY			
	ZINC	ALUMINUM	MAGNESIUM	COPPER
Up to 50 sq. inches	± .004	± .005	± .005	± .005
50 to 100 sq. inches	± .006	± .008	± .008	——
100 to 200 sq. inches	± .008	± .012	± .012	——
200 to 300 sq. inches	± .012	± .015	± .015	——

NOTE: The above tolerances are to be added to Linear Tolerances worked out for a dimension as provided in Standard E1.

Additional tolerances in the case of moving die parts are shown in Standard E3.

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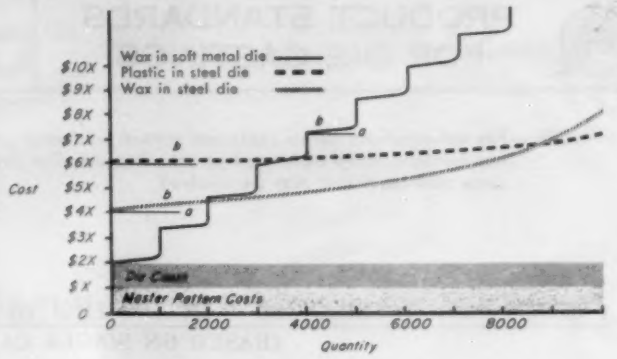
The way quantities and tool costs affect choice of tooling and patterns

THE COST of soft metal dies is compared here with the cost of permanent steel dies, illustrating the fact that, at some level of production, the cost of a permanent die drops below that of the soft metal die. The exact point at which this occurs, in any specific instance, depends primarily upon the actual cost of the steel die. The more complex the die, the greater must be the production to justify its usage.

The slope of each curve indicates the cost of patterns required to make the final castings. Wax patterns which fail in production, break or bend in storage or handling, melt in cluster assembly, break while being vibrated or vacuumed or give warped castings, tend to raise their cost. Plastic patterns, while costing more, withstand the rigors of production better. This advantage is indicated by the lesser slope of the curve for plastic patterns. The slope between "a" and "b" is the result of die wear, which increases the number of rejects and hence, the cost of patterns.



Wax Or Plastic Patterns

. . . which is better suited for your investment castings?

If you buy investment castings, you'll want to know how the factors of quantity, shape, dimensions, affect tool and pattern costs.

By WILLIAM BLAZEK, Process Engineer
Head of Development and Research
Midwest Precision Castings Co.

THE primary factor concerning the selection of either wax or plastic for investment casting patterns depends strongly on cost. Plastics are a luxury, enjoyed by those whose capacity warrants their use — and advantages, while wax is the workhorse.

The properties of wax, for the most part fulfill the majority of qualifications for pattern material. The material is inexpensive, easily worked, and available in a variety of properties. Its greatest advantage is that it can be injected into inexpensive soft-metal dies, a necessary property for short run jobs.

As the job quantity increases, say from 50 to 100 pieces, or to 5,000 pieces, the cost of making the wax pattern remains constant, but a new factor appears — the cost of die maintenance. Soft-metal dies do not enjoy longevity, and dimensions suffer as a result of excessive die wear. As job quantities become larger, the engineer must content himself with added die overhead, planning to make a new die every time the old die wears, or make a hardened steel die. (See chart, above.)

Not only does production quantity decide whether wax or plastic patterns should be used, but the nature of the casting contour itself has

INVESTMENT CASTINGS

MULTI-SECTIONED, assembled plastic patterns solve many problems of intricate shapes. Patterns shown above and their dies are by Jet Die and Development Co.

TYPICAL SHAPES produced by investment casting are sketched, right. How these shapes affect pattern and tool problems is noted.

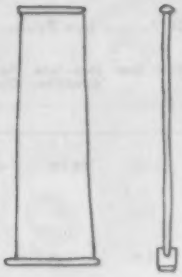
great bearing on the selection. Certain forms and shapes may demand the use of one material more than another, just as they may affect die design and cost.

Plastics have some properties that make them "natural" for certain patterns. The low shrink in thin sections and excellent dimensional characteristics are advantages. Illustrated are several types of sections suited for plastics. Top right illustrates the long thin sections which require a rigid pattern material; the photograph is an example of the multi-sectioned assembled pattern and the thin complex contour possible. As these illustrations might suggest, there are also designs that would be fruitless in plastic.

Patterns with thick and heterogeneous section thicknesses, multiple complicated coring and unreasonably close tolerances are those which should be considered with doubt. All of these factors contribute to high plastic pattern cost, and questionable results. Not only do thick plastic sections increase the injection time cycle, but they make it more difficult to maintain dimensions. Also these heavy pattern sections tend to rupture the investment mold due to the high volumetric expansion of the plastic. Complicated coring results in a high die cost, unless the pattern can be injected in pieces and later assembled.

Experience and adherence to good casting design principles also go a long way in deciding material selection. The logical approach would be to work out the problems as inexpensively as possible in wax, and convert to plastic as production and design dictate.

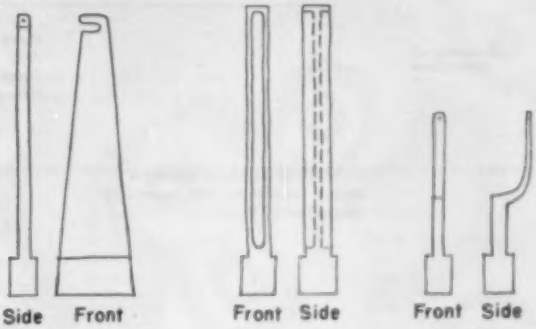
Jet Blades

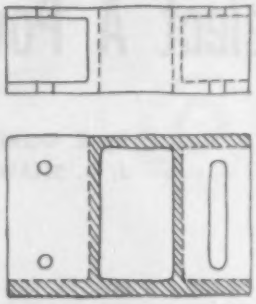


LONG THIN SECTIONS

Long thin sections which must be cast straight often require the rigidity of plastics on large production orders. Jet blades are an excellent example.

Miscellaneous

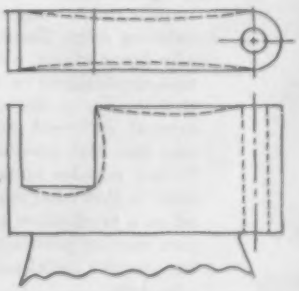




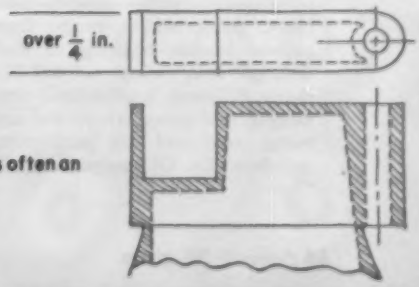
MULTI–CORED SECTIONS

Plastics should not be used for multi-cored patterns because of excessive die costs. Possibly a solution may be evolved using the assembled pattern technique in such cases.

HEAVY SECTIONS



Heavy Sections should be avoided for two reasons — volumetric cavitation and volumetric expansion. Cavitation causes dimensions to suffer and excessive expansion will cause molds to rupture. (produce mold ruptures or cracks)



Coring the pattern is often an effective solution.

TABLE I—Physical Properties Of Various Iron Powder Compositions

	Red. Iron	Elec. Iron	Elec. Iron Graphite	Sp. Iron Graphite	Elec. Iron 7% Copper	Red. Iron 7% Copper Graphite	Elec. Iron 7% Copper Graphite	Elec. Iron Graphite 20% Copper Infiltr.	Elec. Iron Carburized	Red. Iron Graphite + Cr-Ni pre-alloyed
Tensile str., psi	24,100	23,400	58,500	40,000	57,000	75,000	90,000	109,300	90-160,000	100,000
Elongation, % in 1"	9.2	10.2	5.2	4.0	2.0	0.5	1.2	1.0	1-2	2.5-4.5
Density, g/cc	6.51	6.92	7.06	6.71	6.72	6.66	6.81	7.82	7.2-7.7	7.10
Hardness, Rock.	H-84	H-83	B-62	B-48	B-60	B-94	B-89	C-25		C-25
Sequence of Operations					Blend Press Sinter Inspect			Blend Press Sinter Coin Blend Infilt Press Infilt Infiltrate Clean Inspect	Blend Press 1st Sinter Size 2nd Sinter Inspect Carburize Harden Inspect Draw Lcl Harden Inspect	Blend Press Sinter Inspect

Note: All of the above specimens except "electrolytic iron, carburized" compacted at 50 tsi.

How To Select A Powder Metallurgy Process

By E. GORDON, Metal Hydrides, Inc., and
J. D. SHAW and W. V. KNOOP, S-K-C Research Assoc.

WHEN a process is as useful and promising as powder metallurgy, there are many individual efforts to invent new techniques or to improve upon the existing ones. These efforts usually bring about new techniques and applications with the result that the design engineer is offered several different methods to obtain the end product he desires. Today, powder metallurgy, which falls in this category, is recognized as a production tool which offers various processes for obtaining powder metal parts to do specific jobs.

Ferrous and non-ferrous materials are made into powder metal parts which range from porous bronze bearings to high density iron alloy parts. The many different applications poswheels, and many others are now being used and are performing satisfactorily. Of course, the obsible by powder metallurgy require varied techniques for obtaining these parts. A major classification is powder metal parts for structural (engineering) applications where high strength, ductility or good wear properties are necessary. This classification can be limited to iron and iron alloys.

As familiarity increases with the jobs that powder metallurgy can do, the field is expanding continuously and powder metal parts are being substituted for many of the parts that were previously made by machining from solid stock, castings, or by any of the metal working processes. Such parts as gears, cams, rollers, pins, vious advantages of this field are high rate of production and lower cost per unit.

Powder metal parts for structural applications are made from various powder combinations (a) iron powder and carbon, (b) iron powder and copper powder, with and without carbon, (c) iron powder and carbon, copper infiltrated, (d) iron powder and prealloyed chromium-nickel powders.

The design engineer must first decide what properties he is looking for, and then determine which of the processes available will give these properties. Finally, he must compare the costs of these processes. Knowing all of these factors, he can then decide on the process to be used.

The generally accepted properties by which a powder metal part is judged are density, hardness, tensile strength, and elongation. Other factors which should be considered are fatigue, impact strength, and wear resistance.

Under any set of multiple operations such as pressing, pre-

Continued on page 38

TABLE 2—Typical Costs Per 100 Pieces*

	Composition** I	VIII	IX	II	V	III	VI	IV	VII
Production Costs	$ 3.64	$ 7.98	$ 7.98	$ 3.64	$ 3.64	$ 3.64	$ 3.64	$ 3.64	$ 3.64
Die Costs	0.50	1.25	1.25	0.50	0.50	0.50	0.50	0.50	0.50
Burden	9.10	19.95	19.95	9.10	9.10	9.10	9.10	9.10	9.10
Powder Costs	7.78	3.29	7.03	1.87	6.04	2.03	6.07	2.24	6.11
TOTAL COST PER 100 PIECES	$21.02	$32.47	$36.21	$15.11	$19.28	$15.27	$19.31	$15.48	$19.35

***Note: Size of parts approximately 1" diameter x 1" high; six parts weighing 1 lb. For detailed analysis of these costs, see tables 3 and 4, below.**

****Compositions are listed in Table 4.**

TABLE 3—Cost Estimate For Fabricating Powder Metal Parts By Various Methods

Size of Parts — A part approximately 1" in diameter x 1" high, six parts weighing 1#.

COST BREAKDOWN

1. Cost of Blending Powders
1000# mixer — hour per charge
Labor, Supervision and Equipment Charge — $3/hour
Per pound — $.003
Per 100 pcs. — $.05

2. Pressing
Press charge including labor and supervision — $10/hour
Rate of Production — 25 pcs./min. — estimated 75% efficiency of operation
25 x 60 x .75 = 1125 pc./hour
Per 100 pcs. — $0.89

3. Sintering
Furnace charge — $15/hour for 100# per hour furnace. Includes labor, supervision, atmosphere, power.
Per pound — $.15
Per 100 pcs. — $2.50

4. Coining
Press Rate 50 pc./min. @ an estimated 75% efficiency — $10/hour charge.
50 x 60 x .75 = 2250 pc./hour
Per 100 pcs. — $0.44

5. Infiltration
Same charge as for Sintering.
20% Infiltrating material employed.

6. Cleaning
10 pcs./min. — $60/hour
Per 100 pcs. — $0.10

7. Inspection
25 pcs./min. — $15/hour
Per 100 pcs. — $0.60

8. Die Costs
For Pressing — $2000/set
For Coining — $500.00/set
Estimated die life with carbide — 400,000 pcs.
Per 100 pcs. — $.50
Per 100 pcs. — $.75 (for pressing infiltering material compacts)

OPERATIONS

METHOD A

(a) For Alloy Addition
(b) Copper Addition
(c) Iron & Graphite Only

1. Blend Powder
2. Press Green Compacts
3. Sinter
4. Inspect

METHOD B

For Infiltration

1. Blend Powder
2. Press Green Compacts
3. Sinter
4. Coin
5. Blend Infiltrating Material
6. Press Infiltrating Compacts
7. Infiltrate
8. Clean Residual Material from Surface
9. Inspect

COSTS PER 100 PIECES

(a) Production Costs

METHOD A		METHOD B	
Operation 1	$ .05	Operation 1	$ .05
2	.89	2	.89
3	2.50	3	2.50
4	.20	4	.44
		5	.01
		6	.89
		7	2.50
		8	.50
		9	.20
Total	$3.64	Total	$7.98

TABLE 4—Cost Of Powder Blends

Blend		Per $	Per 100 pcs.
I.			
91 Reduced Iron	@ .1125	$ .1024	
7.5 M-H Alloy	@ 4.85	.363	
1.5 Graphite	@ .10	.0015	
		.4669	$7.70
II.			
98.5 Reduced Iron	@ .1125	.1108	
1.5 Graphite	@ .10	.0015	
		.1123	$1.87
III.			
95.5 Reduced Iron	@ .1125	.1074	
3 Copper	@ .425	.0128	
1.5 Graphite	@ .10	.0015	
		.1217	$2.03
IV.			
91.5 Reduced Iron	@ .1125	.1029	
7 Copper	@ .425	.0298	
1.5 Graphite	@ .10	.0015	
		.1342	$2.24
V.			
99 Electrolytic Iron	@ .365	.3614	
1 Graphite	@ .10	.0010	
		.3624	$6.04
VI.			
96 Electrolytic Iron	@ .365	.3504	
3 Copper	@ .425	.0128	
1 Graphite	@ .10	.0010	
		.3642	$6.07
VII.			
92 Electrolytic Iron	@ .365	.3358	
7 Copper	@ .425	.0298	
1 Graphite	@ .10	.0010	
		.3666	$6.11
VIII.			
98.5 Reduced Iron	@ .1125	.1108	
1.5 Graphite	@ .10	.0015	
+20 Copper (Infiltrated)	@ .425	.0850	
		.1973	$3.29
IX.			
99 Electrolytic Iron	@ .365	.3614	
1 Graphite	@ .10	.0010	
+14 Copper (Infiltrated)	@ .425	.0595	
		.4219	$7.03

(b) Die Costs

METHOD A		METHOD B	
For Pressing	$ .50		$ .75
For Coining			.50
	$ .50		$1.25

(c) Burden, [250% of (a)] — $9.10 — $19.95

4 Parts That Cost Less By Powder Metallurgy

ONE PLACE you can save money on small metal components is the elimination of machining . . . as is indicated by these four typical examples, each redesigned from machined part to powdered metal part.

Savings range from 73 to 90 percent; several compositions of metal powder have been selected, depending upon the properties desired. These pieces, chosen from production at Yale & Towne Mfg. Company's Powdered Metal Products Division, are representative of the economy of powder metallurgy as a fabricating method.

Photos: F. J. Stokes Machine Co.

DEVIATIONS from the round are expensive to machine from bar stock, but no problem to powder metallurgy. This three-tooth ratchet for a business machine could only be machined at great cost, requiring several setups. It is now pressed from an iron-graphite powder to a high density, which permits heat treating to Rockwell C-60 for required wear properties.

Saving--75 Percent

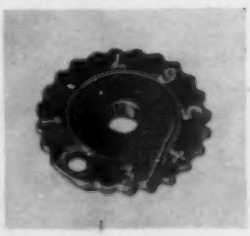
GEAR CLUSTERS usually call for assemblies of individually machined gears. Shouldered teeth present machining problems, and helical gearing is an even greater problem. Here, however, a helical spur gear cluster combines both in a single component, pressed from iron powder. It is used in the speed reduction unit of an oscillating fan. Good wear properties are obtained.

Saving--80 Percent

FACE DETAIL, other than that which can be formed about the axis of rotation, is difficult and expensive by conventional machine shop methods . . . routine by powder metallurgy. Here a face ratchet used in a dictating machine is pressed from an iron-copper powder composition. Also formed at the same time is a serrated hub which serves as a splined interlock with the mating member.

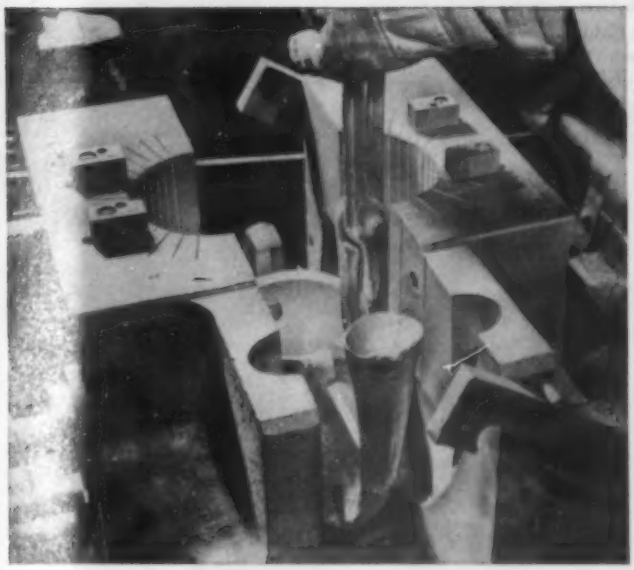
Saving--73 Percent

VARYING THICKNESSES in a relatively thin component are almost impossible to machine. The varying section thicknesses of this ringer-silencer for a telephone act as a cam to control the loudness of the bell, and is pressed and coined into this powdered bronze piece. Numbers formed in the cam surface indicate settings. Tolerances must be and are closely held.



Saving--90 Percent

use 'dag' dry films for trouble-free lubrication



Where scratching or scrubbing soon removes an ordinary die coating, 'dag' dispersions adhere to the die surface and provide clean and easy release, casting after casting. 'dag' Colloidal Graphite works into the pores of the die metal, giving a slick, adherent, permanent *dry lubricating film.*

A die-caster tells us that he has used 'Oildag'® —'dag' Colloidal Graphite in petroleum oil—diluted in carbon tetrachloride to coat his molds, and eliminated pick-up from the molten zinc he casts at 900°F. He makes more than a thousand castings per mold before touching up the dies, and his production has been speeded up more than 200%!

You'll find a surprising number of ways to use 'dag' dispersions described in our free literature. Write today for Reprint DC and Bulletin No. 426-X10.

Dispersions of molybdenum disulfide are available in various carriers. We are also equipped to do custom dispersing of solids in a wide variety of carriers.

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POWDER METALLURGY
continued from page 34

sintering, coining and resintering, the end result using iron powder alone is a ductile product which may be too soft to be used in some structural applications,[1] without subsequent heat treatments.

Iron powder in combination with graphite brings the tensile strength up to around 60,000 psi maximum and lowers the elongation, but results in a better material for some applications. Iron powder, brought to a high density and high strength by multiple pressing and sintering operations plus carburizing and heat treatment, gives still better physical properties.[2] Here, depending on the final properties desired, tensile strengths can be obtained well in excess of 100,000 psi.

Iron powder with primary copper additions, at best, bring tensile values to about 60,000 psi maximum with elongation values of less than two percent. Addition of graphite brings the tensile strength to about 100,000 psi but with very low elongation, and generally only after special treatment.

Iron powder and graphite compacted, presintered and sized, followed by copper infiltration can develop tensile values up to 100,000 psi but with little elongation. Special treatments and infiltration with high amounts of copper (20% and over) can bring the tensile values up to 125,000 psi, but with almost no elongation.

Iron powder with graphite and additions of prealloyed chromium-nickel powder (3) gives tensile properties in excess of 100,000 psi and average elongation of about two to four percent. Heat treatment can bring the physicals well in excess of 125,000 psi with about the same elongation.

A rough use classification for the preceding methods would separate them into two categories. For engineering applications where a high strength part is needed either prealloyed chromium-nickel powder additions, copper infiltration or high density carburized parts would serve the purpose. For less stringent service demands, iron powder with or without graphite, or primary copper and graphite additions to iron powder are satisfactory.

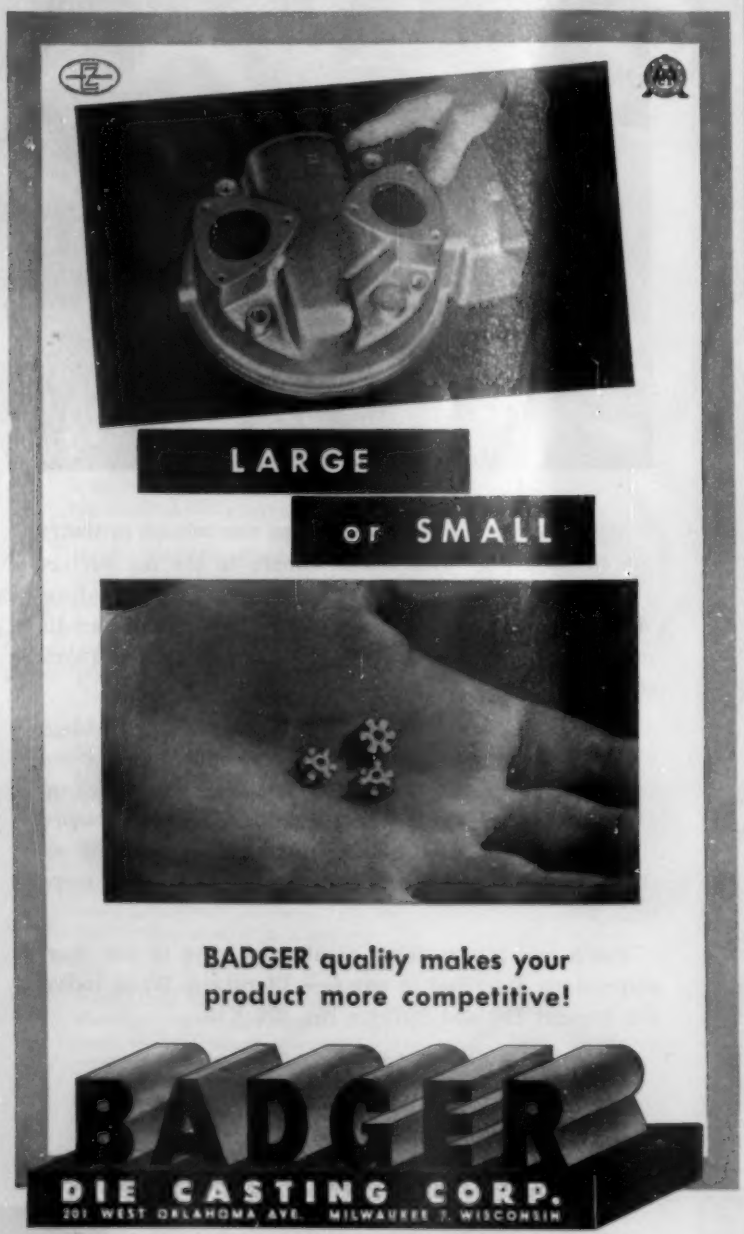
Table 1 shows average physical properties for the various methods discussed, and the processing steps necessary to obtain these properties.

There are some basic disadvantages to some of the processes such as lamination when pressing certain iron powders at high pressures, segregation when adding primary copper powder, and performance characteristics with regard to ductility and wear resistance of the copper alloys.

It is shown that to get the high tensile properties necessary for engineering applications either multiple operations are necessary or prealloyed chromium-nickel powder additions can be used to eliminate the multiple operations, to obtain similar properties.[4,5]

Thus, knowing the physical properties obtained by the various processing techniques, it is necessary to compare costs to arrive at the process which will be employed.

Continued on page 81



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This company prefers permanent mold castings to sand castings because it has found that

Precision Foundry Practice Gives Better Castings

By **JOHN WAVRUNEK,** Metallurgical Engineer, Milwaukee Gas Specialty Co.

NORMAL foundry practice is to credit the purchaser of castings with the delivered cost when casting defects are discovered. This procedure is all very well if the defects are discovered before any appreciable amount of money has been spent on second operations. When, as is the more usual case, a considerable amount of machining time has been expended before casting defects are disclosed, then the purchaser of the casting is "out" both the money spent on machining and the production.

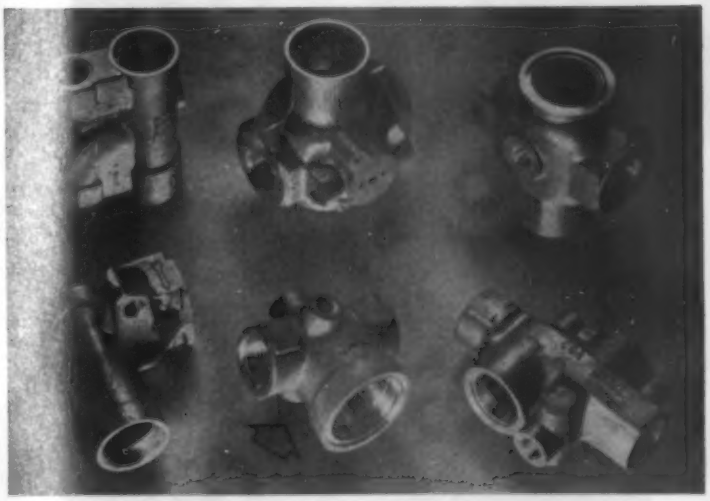
Because this unfavorable situation exists, many companies who do extensive machining on aluminum castings have converted to either full permanent mold or semi-permanent mold castings from sand castings.

In general, the most important reasons for converting to permanent mold castings are:

1. Absence of, or at least, greatly lowered porosity.
2. Better surface for unmachined areas.
3. Improved mechanical properties due to finer grain structure.
4. Closer dimensional tolerances, requiring less machining and giving lower scrap loss.
5. Generally cheaper than sand castings.

Long experience with full and semi-permanent mold casting, as well as with sand casting, has shown that the cost of tooling for permanent mold casting is higher, usually by a factor of about 2 to 1. On the other hand, the rate of production and the pieces-per-man-hour are considerably higher for permanent mold casting. Here the ratio of production is about 5 to 4. Generally, a full cycle for a two cavity mold is about one minute, or 120 pieces per hour.

In addition to the higher production rate, there is a saving of the cost of shake-out in the absence of both sand and flask handling.

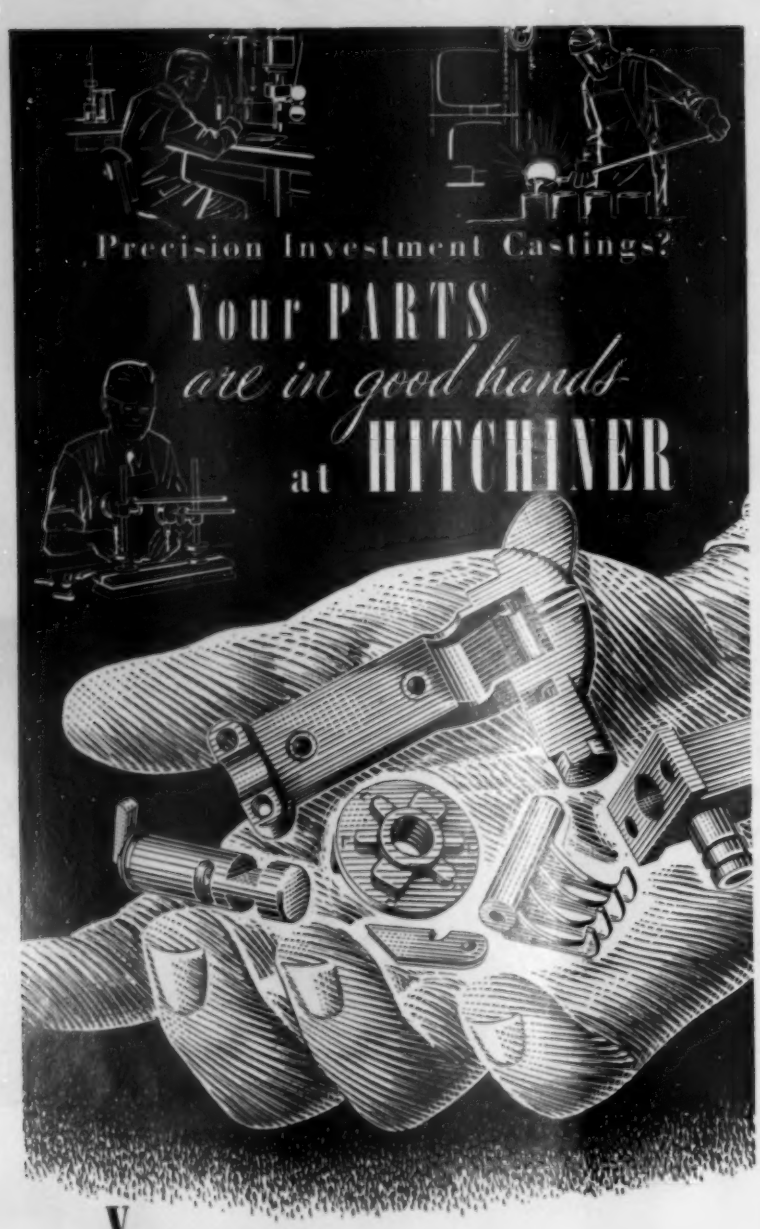


MELTING AND CASTING of metal for these typical valves is closely controlled for high quality. All of these have sand cores except the piece indicated by arrow.

The aluminum alloy we most commonly use is ASTM SG-70A. Other alloys also are used, their choice being dependent on the casting characteristics of the alloy and the mechanical properties required. In producing these castings, the alloy is melted in low frequency induction melting furnaces. After the proper melting temperature is attained, the metal is transferred to low frequency induction holding furnaces from which the operators ladle the metal into the permanent mold dies.

Metal temperatures are held within a tolerance of $\pm 10°$ F. Extreme care is exercised in transferring metal from the melting furnace to the holding furnace to avoid excess turbulence or exposure to the atmosphere, thus minimizing the possibility of gas absorption in this operation. Test equipment which provides a method of solidifying molten metal under vacuum is used to evaluate the gas content of the molten alloy and has proven to be a valuable

Continued next page



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nell hardness in the range of 75 to 100 using a 500 kg load. The ultimate tensile strength, after heat treatment is about 40,000 psi.

After heat treatment and prior to any machining the castings are cleaned by blasting with wet or dry abrasives. It has been found that the degree of lustre and smoothness can be accurately controlled by the selection of the proper type and size of abrasive employed. A drum type of machine is most commonly used. Uniformity of surface appearance is a characteristic of the process.

Most of the machining operations are relatively simple. Boring, facing and threading being the most usual. Since every valve body must have a smooth, finely polished seat, the need for good machining characteristics and absence of porosity or internal defects is very apparent.

It is of interest to note that of the six valve bodies shown, only one (lower center) is a full permanent mold casting. All of the other use one or more sand cores.

DESIGN ENGINEERING SHOW SCHEDULED IN MAY

The first comprehensive exposition and technical conference devoted to the problems of design engineers will take place at Convention Hall, Philadelphia, May 31 to June 3, it has been announced by Clapp & Poliak, Inc., New York exposition management firm.

The exposition, to be known as the Design Engineering Show, will be the successor to the Basic Materials Exposition, held previously in New York and Chicago.

"Although many of the features of the Basic Materials Exposition will be retained," said Saul Poliak, president, "the emphasis will now be placed on design engineering rather than solely on basic materials, as in the past. For example, mechanical, electrical, hydraulic and pneumatic components of end products, finishes, coatings, and other parts, shapes and forms, will be featured along with materials. These materials will include all the metallics and their various alloys, as well as the non-metallic materials."

Alexis De Sakhnoffsky Describes

That Die Cast Look

. . . what it is, how to use it in your product

THE HIGHLY INDIVIDUAL STYLE of designer Alexis De Sakhnoffsky, author of this commentary, will be recognized in the drawings which accompany it. These designs represent one phase of his work for Grand Rapids Brass Company for whom he is consulting engineering stylist, not only designing the company's new products, but also serving as consultant for customers of the company's jobbing die casting facilities. De Sakhnoffsky has been a leader in product styling, especially in the automotive and appliance fields, for more than two decades, and his list of clients reads like a Who's Who of American manufacturing.

AN experienced stylist does not confine his work to creating pleasant shapes for a product developed by the Company's engineers. A well-styled item should appeal to more than just sight. Something in its appearance might suggest the method of its manufacturing or its very feel could create confidence in the way it was designed.

The product should bear the intrinsic characteristics of the manufacturing process which brought it to life. It is good styling practice to emphasize the qualities of the material used. It is only logical to build the design around the characteristics which belong to that material only and cannot be easily duplicated in any other.

If such characteristics arouse the consumer's interest, they will become symbolic of that particular industry and bring with the acceptance of the product added publicity and increased sales.

Before charging headlong into beautifying the product it pays to search for definite reasons, which will help make it stand out.

The object of the search is to get "the feel" of the particular industry. Once acquired it permits the stylist to automatically produce designs which appeal to more than one human sense. And generally it is possible to inject something which will be pleasing and intriguing to three or more of our senses.

Present day stylists are often compared to general practice physicians (I refer here to free-lance and not captive stylists). Both have a basic acquaintance

Color accents on chromium-plated, die cast Kitchen pulls and freezer locks create a feeling of warmth highly appropriate in a modern kitchen.

that die cast look — cont.

with hundreds of industries in one instance and dozens of diseases in the other. However, each new "case" requires additional research and specialized study. In this case I will confine my remarks to die casting styling, which is the scope of this article.

The developments of the last 10-15 years have made the die casting industry a strong, young giant who has made great inroads in a number of fields. Due to the improvement in quality alloys, die castings are now sought for their inherent physical qualities.

However, often an inexperienced eye has difficulty determining whether a shiny piece of trim on a glistening auto is a stamping or a die casting. The object of "designing for a medium" is to make the difference obvious.

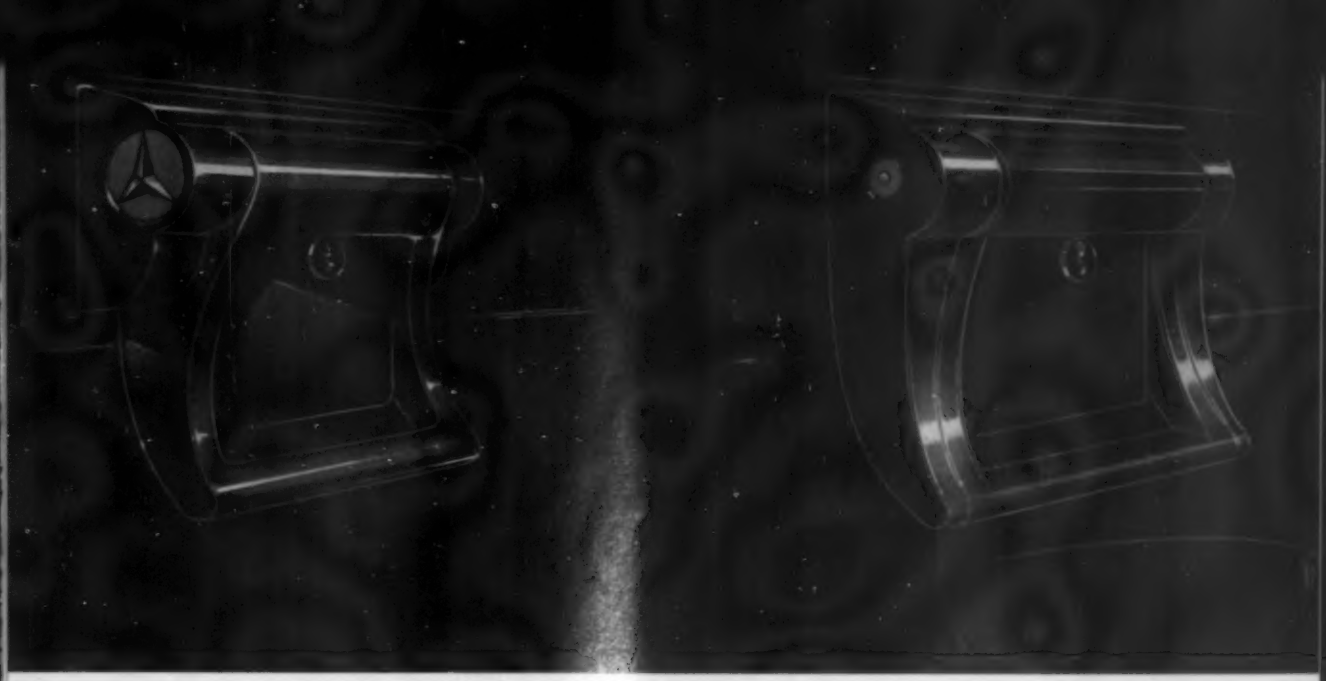
A manufacturer using stampings or castings as parts of his finished product may have a cost or assembly problem and decide to inquire into the advantages of die castings. He sends samples of his part and asks for quotations. As a rule that is all he will get. Though the structure of the new die cast version of his part will be different, the new product will bear the characteristics of the original manufacturing process. Is it logical to copy a design, which was built around the limitations imposed by an entirely different process?

When the engineering of the die cast version is completed the new approach requires the stylist to add "that die cast look."

Let us analyze what makes a die casting immediately recognizable. The possibility of fine detail appeals to our sense of sight. They impress our sense of feel by their substantial weight. Finally drop a die casting and just by the sound you will be able to tell the toughness and strength of the metal. As the saying goes, they are built like a battleship.

This immediately suggests strength and inspires confidence in the buyer. To the engineer the structural qualities mean elimination of re-inforcements, durability and added precision in specifications.

A glaring example may be found in the range field. Most



modern ranges are composed of a table top and so-called "back guard", which supports an instrument board with all the dials and controls. This back guard is a stamping, reinforced by brackets and has either a stamped or die cast frame, trim moldings and all the additional items. Think of how much simpler it would be to use for the back guard a single die casting. Not only will it be stronger but the re-design will eliminate the major assembly headaches, matching finishes and complicated parts lists.

Over a period of years my designs have been used by the automotive, radio, appliance and many other fields. I wish to outline some of my philosophy used in designing die casting and make some suggestions for new designs.

My styling work has always been recognizable by the use of bright colors. Though most of my styling has been devoted to the automotive and mechanical fields, I have always had a soft spot for the American kitchen. The reason for it is that I believe to be the first to add brilliant hues, when I introduced in 1933 the Vollrath line of enameled kitchenware finished in violent reds, yellows and greens. In 1936 I was testing consumer acceptance of colored refrigerators for one of the leading companies in that field.

My approach to the question of color is entirely emotional. As a sensitive Oriental (I was born and raised in Tsarist Russia) I react to colors instinctively. No market research will ever make me use colors which do not appeal to me. I leave such scientific approach as market research to stylists who have not developed a color sense and have to depend on such mechanical means to provide the right coloring for their creations. The fact that my color selections have been successfully used on toys, motor cars, trucks, furniture, radios, packaging etc., may mean that my emotional batting average has not been entirely wrong.

There is nothing appetizing about white. This dead color suggests sanitation, antiseptics, — anything but aromatic tasty food. Let us remember that the best tasting food does not come from the most sanitary kitchens. That was my reasoning 22 years ago when the only acceptable kitchen colors were cream or white trimmed in black.

This also applies to hardware. I feel that unadorned, highly finished chrome pieces lack "feel-appeal". Though essentially functional-looking on an automobile these shapes have to be mellowed for the use in a home. I believe that a handle, knob or pull should be intriguing enough to create an inpulse to handle it.

Once you have felt that impulse and touched the item it is part of you. The intriguing quality may be its shape ("Doesn't it feel good?"), or its massiveness ("Just feel its weight!"), or maybe the fine detail ("I wonder how this was done?"). Without such intriguing features there is something cold and threatening about sharp, polished surfaces, which suggest surgery. And who wants to entertain such thoughts in as enjoyable place as a kitchen?

I feel that this is one of the underlying reasons for the use of color and warm gold finishes which are becoming increasingly popular. They add so much to the appeal of a range, freezer or refrigerator. Though those color accents have been confined so far

Die cast cabinet pulls can be slim and feminine or tailored and massive.

to monograms, dials or escutcheons I forecast great styling possibilities in that direction.

As an illustration, I am showing herewith my latest designs featuring a discreet way of using color on kitchen pulls and freezer locks. On one of the sketches I use a red dot ornament, on the other red checker effect suggesting gingham. Both are highly appropriate in a modern kitchen, since red is now universally adopted as a kitchen color. Psychologically the red dot reminds one of a gay polka-dot apron and the red squares an informal appetizing tablecloth.

An example of the color use on a freezer handle is given on another illustration. Here I emphasized the pivot of the lock handle by carrying horizontally a cylindrical form. A colorful monogram is placed at the axis of the cylinder. Besides locating the color accent at the focal point of one of the design's features, this monogram permits immediate product identification when the freezer is approached at an angle. This last feaure is impossible on plain, conventional handles.

The cabinet pull designs can be divided into two groups. Some of them are slim and feminine, designed for delicate hands. Still their depth suggests a die casting by their solidity. The others are tailored and massive in line with the present trend of larger, more impressive handles and kitchen controls. Some of the pulls were designed for the protection of the kitchen cabinet finish. Such is the loop or "6"- shaped pull which will keep the user's finger nails away from the finish.

Finally what is the current outlook for die cast products in various fields.

AUTOMOTIVE: Die castings are occupying continually increasing styling areas. Die cast hubcaps have appeared on several recent car models. Many stamped items are irrevocably replaced by die castings.

APPLIANCES: Larger use of die castings is forecast on most electric appliances. Newest designs include scroll decorations and gentler curves designed to soften the former "slab" type handles and hinges.

PLUMBING: Die cast fittings have occupied an entrenched position for a number of years. Still, stylists have been handicapped by the necessity of combining cast and die cast pieces. Corrosion due to high temperatures have restricted the use of die castings throughout. I hope it will be just a matter of time before new developments will permit finer detail and uniform finish of all-die cast fittings. I predict increased use of gold finishes which are not yet entirely practical.

RADIO-TELEVISION: This is the latest industry to feel deeply the invasion of die castings. Several of the largest manufacturers have chosen to give their controls, panels and screen frames "that die-cast look".

Program Listed For Metal Powder Association Annual Meeting

Again this year, as it has in the past, the Metal Powder Association will sponsor a national meeting and show May 10-11-12, at the Bellevue-Stratford Hotel, Philadelphia, Pa. devoted solely to powder metallurgy, the metal powder industry and the arts and sciences based on metal powders.

Both events, though sponsored by the Association and its members, are open to anyone, M.P.A. member or not, interested in powder metallurgy and the industry that has grown up around it.

Technical sessions at the 11th annual meeting are divided into (1) a general session devoted to papers relating to a variety of aspects of powder metallurgy, and (2) an electronic core session consisting of a separate meeting. Program of the General Session includes the following:

Machinability Of Sintered Bronze
W. A. Irvine, The Maytag Co.
Finishing And Plating Of Metal Powder Parts
C. C. Cohn, Colonial Alloys Co.
Pre-Alloyed Steel Powders And Application
G. A. Roberts and A. Grobe, Vanadium-Alloys Steel Co.
Carbide Tooling For Pressing Metal Powders
T. A. Wilson, National Carbide Die Co.
The Iron Powder Industry In Europe—Present And Future
S. I. Hulthén, Hoeganaes Billesholms Aktiebolag
The Economic Production Of Metal Powder Parts In Small Volume
B. I. Horton, Pitney-Bowes, Inc.
A Powder Producer Looks At Titanium Powder Metallurgy
J. F. Sachse, Metals Disintegrating Co., Inc.
A Fabricator Looks At Titanium Powder Metallurgy
H. W. Dodds, The Brush Laboratories Co.

The Electronic Core Session, running concurrently, will include:

Trends In Ferrite Core Design For TV Yokes And Flybacks
C. E. Torsch, The Rola Co.
Antenna Cores
C. A. Grimmett, General Electric Co.
Application Of Ferrites To Memory Systems
W. N. Papian, Mass. Inst. of Tech., Lincoln Lab.
The Various Iron Powders Used In Electronic Cores
J. A. Roberts, Antara Chemicals, Div. General Aniline & Film Corp.
Some Results Of The Evaluation Program For Iron Powdered Cores
E. Both, Squier Signal Lab., Signal Corps Eng. Lab.
Method Of Specifying Iron Cores
C. E. Cherry, Jr., Metal Powder Association
Panel On Threaded Cores
Moderator: R. D. Ponemon, Pyroferric Co., Inc.

The 1955 Metal Powder Show opens at noon on Tuesday, May 10 and at 9:00 A.M. Wednesday, closing both nights at 7:00 P.M. On Thursday, the show will be open from 9:00 A.M. to 3:00 P.M.

TO DISCUSS CORROSION

"Practical Corrosion Problems and their Practical Solutions" was named as the theme for the Spring Northeast Regional Corrosion Conference to be held under the auspices of the National Association of Corrosion Engineers at the Statler Hotel in New York on May 9, 10 and 11. F. J. LeFebvre and Frank E. Kulman, chairman and vice chairman respectively of the New York Section of NACE, made this announcement recently.

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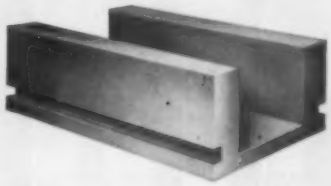

GROUND FLAT, PARALLEL and SQUARE . . .
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A TYPICAL DIE CAST DIE
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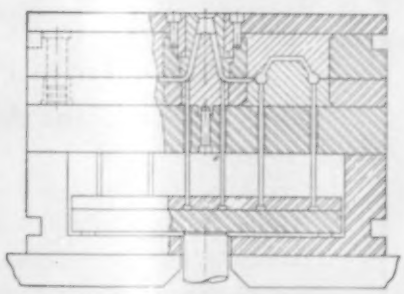

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400 Engineers And Buyers Get

A Close Look At Die Castings

THE ENORMOUS RANGE of die castings being produced commercially today impressed the more than 400 engineers and buyers who were guests of the American Die Casting Institute's Eastern Regional Group last month.

A steady stream of spectators handled and examined the hundreds of examples of the die caster's art, collected for the display at Newark's Robert Treat Hotel February 15. Every hour between 3 and 10 p.m., there was a showing of the new color movie, "Die Casting — How Else Would You Make It," produced by the American Zinc Institute.

During the seven hour continuous program, 411 guests representing 152 companies who use or might use die castings, attended the sessions. Purpose of the showing was to acquaint industry with some of the potentialities of die castings in all types of products. Experts from the ADCI member companies were on hand to answer technical questions and to advise visitors on individual design problems.

Similar sessions are planned in other geographical areas by the several regional groups included in the ADCI.

HUNDREDS of castings are examined.

TWO GUESTS talk with a die caster.

"THIS is our problem . . . "

TECHNICAL questions get answers

By The Millions, Or...

AS FEW AS 50 PIECES

SHORT runs of die cast zinc nameplates are proving that in certain cases, small quantity production of die castings can be economical.

By means of special die construction and pantographic engraving methods, Stemac, Inc., is building dies for this type of casting for very low cost to produce castings profitably in quantities as small as 50 to 100 pieces.

These castings have irregular contours in one plane, but they are generally flat, shallow and uniform in section. This simplifies the die construction and reduces tooling costs.

The samples illustrated here, produced by Stemac, Inc., are nearly all taken from production orders of 250 pieces or less. The specialty of this company is die cast zinc nameplates for local auto dealers and for manufacturers of such equipment as boats, house trailers, machine tools, air conditioning equipment, organizations, etc. Such items as instruction panels, medallions, data plates for machinery, and special decorative or commemorative plaques have also been produced by this method.

Contours and amount of surface detail possible are unlimited, as is evident in the ornate lettering, varied surface effects, special shapes and ornamentation of the pieces illustrated.

The nameplates, delivered with screwholes cored, bosses cast or malleable steel pins for assembling, are cast flat. The ductility of the zinc alloy permits the plates to conform to the curved mounting surface.

Excellent finishability of zinc die castings permits wide choice of surface treatment: plating, painting or a combination of these.

ANOTHER DIE CAST PRODUCT MADE BETTER ON KUX DIE CASTING EQUIPMENT

YALE

AND TOWNE MANUFACTURING COMPANY

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AFTER A TWO-YEAR survey of all leading machine manufacturers, The Yale & Towne Manufacturing Company selected KUX as the line of Die Casting Machines superior to any in the country.

Now, production lines of powerful KUX Die Casting Machines, installed in Yale plants, produce their various hardware castings on a 'round-the-clock basis.

Possibly your product can be redesigned to use die castings with substantial savings in manufacturing costs. Let KUX engineers give you the answer.

MODEL BH-30 ILLUSTRATED

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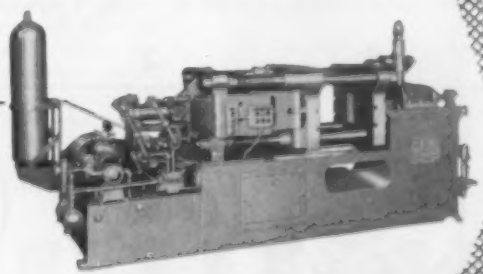

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A Metallurgist Discusses The Question . . .

Do Test Bars Give A True Picture Of Properties Of Investment Castings? Part 2

BY DR. NICHOLAS J. GRANT
Department of Metallurgy, Massachusetts Institute of Technology

In Part I of this paper, published in PMM in February, Dr. Grant outlined the requirements of a test specimen, and general and specific difficulties in producing investment cast test bars. Here are some case studies to illustrate his statements.

This article is based on a paper delivered before the annual meeting of the Investment Casting Institute.

A number of specific cases have been selected to illustrate a few of the major effects described previously and to point up the difficulties which may be encountered.

Case 1: The effect of position of the test bar with respect to its properties and the relationship of its properties to the properties of the casting. The experience to be described occurred in the case of a cobalt base alloy (70 J) which has been utilized experimentally as a turbine bucket for jet engines. Similar results have also been obtained with HS 31 (X-40).

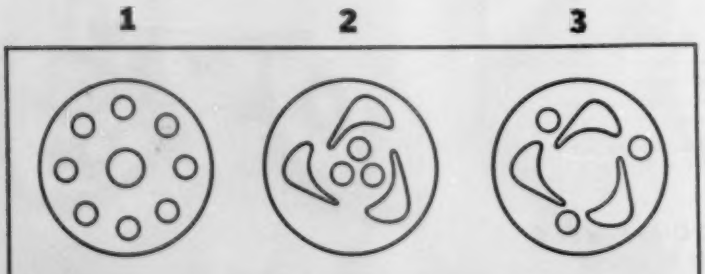
During the course of casting controlled grain size buckets of the J alloy, the first step was to make separate castings of the master alloy in the form of stress rupture bars to evaluate the alloy itself. The arrangement of the eight test bars in the flask is shown in Figure 1. The test bars were arranged in a circular manner in order that each bar would have the same solidification and cooling rate, and in order to obtain the same grain size and also the same properties.

The test bars obtained from this flask showed in stress rupture test at 1500 F and 35,000 psi a rupture life of about 100 hours. This was for the as-cast condition, followed by aging at 1350 F for 24 hours.

The second step in the program was to cast jet engine buckets each of which weighed about 1 pound. Again, a number of ¼ inch diameter test specimens were selected to serve as a measure of the properties of the buckets for control purposes. It should be pointed out at this time that the jet buckets had a maximum section thickness of about ⅝ inch in the thickest part of the airfoil and a section thickness of almost 1 inch in the root of the blade. The buckets and the specimens were arranged as shown in Figure 2.

The three test bars were placed on the inside of the bucket assembly because it was the simplest and cheapest to place them at this point in order to avoid a complicated gating and spruing arrangement to obtain sound specimens. This was a case of trying to attain the simplest and cheapest method which might provide a measure of the properties of the casting itself.

Casting at a flask preheat temperature and a metal temperature which gave the same grain size in these test bars as in Figure 1, it was noted that the creep rupture properties were considerably poorer. At the same temperature and stress, a range of rupture life values of 15 - 25 hours was ob-



ARRANGEMENTS OF TEST BARS in the flask are diagrammed here, showing three different variations. Results of tests on bars arranged in each grouping showed wide range of properties.

tained. It was noted that these test bars were considerably more ductile than were those from the assembly shown in Figure 1.

Improved Rupture Life

It appeared likely that these specimens had cooled too slowly, and as a result had overaged, resulting in the lower rupture life and higher ductility. Accordingly, a new arrangement of buckets and test bars was made and cast. In this instance, the buckets and test bars were arranged as shown in Figure 3. Again the same metal and mold casting temperatures were utilized to obtain the same grain size.

In this instance the test bars showed a large improvement over those in the center of the flask, Figure 2 and a rupture life of about 70 - 80 hours was achieved at somewhat lower ductility. The 70 - 80 hour life was roughly comparable to the 100 hour life obtained in evaluating this alloy, obtained in a separate casting, Figure 1.

It was assumed that if the difficulties were due to non-optimum aging (due to slow cooling in the critical temperature range) when the test bars were in the center of the flask, then test bars from the casting shown in Figure 2 could be made to show better rupture life through a re-solution treatment and re-aging.

Accordingly, several of the test bars which had come out of the center arrangement, Figure 2, were solution treated at 2150 F and air-cooled, followed by aging at 1350 F for 24 hours. Creep rupture testing of these bars brought the values from the 15 - 25 hour range to 60 - 75 hours.

It was therefore established that the test bar properties were not reproducible for the circumstance where they were cast separately as compared to the case wherein they were incorporated in the flask during bucket casting. Subsequent tests on specimens machined from the buckets themselves indicated that the buckets for both casting arrangements, Figures 2 and 3 had comparable rupture life, and that the rupture life was of the order of 60 - 75 hours. Therefore, the test bar arrangement in Figure 2 did not provide a measure of the properties of the casting proper.

It is interesting to note too that in spite of the fact that the grain size of the buckets for the two casting arrangements and of the test specimens for the three casting arrangements were in agreement with each other, the test results were not in agreement. This was due to the fact that whereas the test bars solidified at some given rate, they cooled through the aging zone for this alloy (1300 - 1800 F) at different rates. In the case where the test bars were in the central portion of the flask, Figure 2, the large mass of metal surrounding the test specimen did not permit sufficiently rapid cooling of the

Continued next page

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test bars through this aging range to obtain optimum properties.

In Figure 3, however, the test bars were sufficiently exposed to the cooling condition of the flask so that they cooled through the aging temperature range more rapidly, and therefore had higher creep rupture properties on subsequent controlled aging.

This example illustrates that a test bar may or may not be representative of the casting itself. In the future, if we are asked to utilize a cast test specimen as a measure of the properties of the casting itself, we would plan a program whereby we could establish either that the test bar is directly a measure of the properties of the buckets, or we would try to establish a proportionality which might exist if the test bar is not directly representative of the buckets. The former of the two cases is the more desirable, but it is not difficult to perceive an instance whereby the latter case could be made to apply.

Case 2: Casting an aluminum alloy with 5 percent silicon. If one examines the handbooks for aluminum — silicon alloys, one finds that this alloy should show 30,000 psi tensile strength with about 5 percent elongation. During a program of research in which this alloy was being utilized for test purposes to evaluate the effect of hydrogen on the mechanical properties of aluminum alloys, it was decided to utilize a ¼ inch diameter test bar as a measure of the properties of the alloy and the effect of hydrogen on the properties.

The program was initiated because castings with a section size of about 2 inches diameter had shown gas leakage after machining one face. Test bars from this casting showed 22,000 psi tensile and only 3 percent elongation, both values being under the handbook values. It was presumed that the difficulty was due to hydrogen, which resulted in inter-dendritic porosity and gave the low values of strength and elongation.

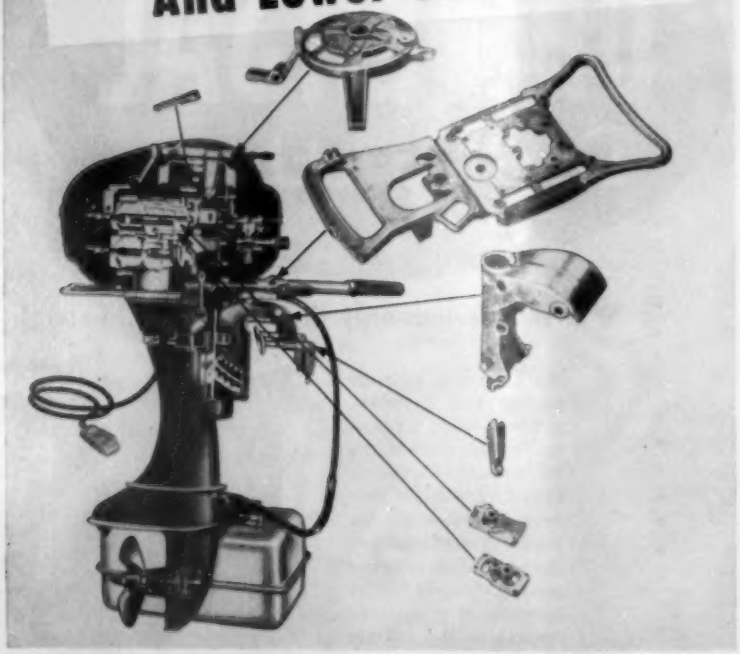
Subsequent tests showed that if the aluminum - silicon alloy was properly de-gassed, then the ¼ inch diameter casting test bar always gave values considerably better than the specified handbook values. It was not unusual to obtain tensile values of the order of 33,000 - 35,000 psi with elongations of the order of 6 - 9 percent.

On the other hand, when the hydrogen content of the molten aluminum - silicon alloy was high, then the mechanical properties of a ¼ inch diameter cast bar were low, and frequently went as low as 18,000 psi with only about 1 or 2 percent elongation.

A final experiment in which test bars of several different diameters were placed in one flask, and utilizing a partially de-gassed melt, showed that the smallest diameter test bars, (0.160 inch diameter) showed

Continued on page 68

More Efficient Production, Better Product Performance And Lower Costs . . .



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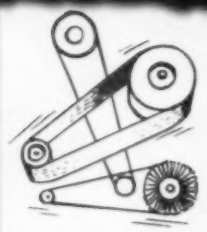
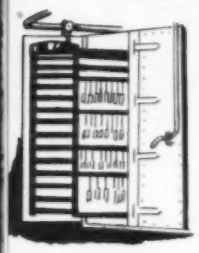
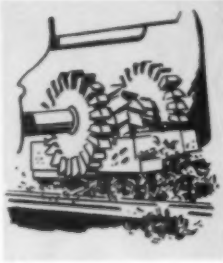
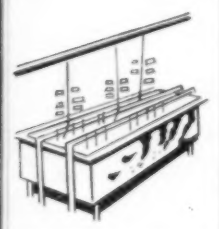
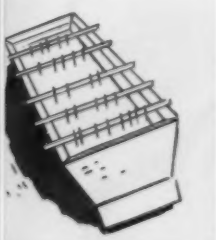




PMM

Finishing Section





Finishing includes all secondary operations performed on precision metal molded parts — up to and including final surface treatment. This section presents new information about the specialized methods, equipment and materials needed for finish-machining, assembly, surface preparation and final finishing of all precision metal molded parts.

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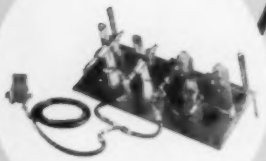
Conforming Matrix spray painting masks withstand thousands of applications, a complete year's run of high production. Plug-type keeps depressed areas clear while spraying background; flip-type protects background while painting depressed areas; block-cutout, plano-surface type coats restricted area for fast wiping operation; cap-type protects raised design while painting background.



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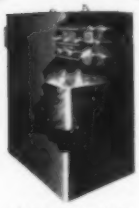

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½ H.P. is sufficient.

Installation of machine requires only the connection of an exhaust, compressed air, and paint tank.

On demonstration production runs for final customer approval, the following production rates were obtained:

Plastic toys, 900 pieces per hour. Automotive transparent lacquers applied to horn buttons, 600 pieces per hour.

Automotive die cast tail light bezels 450, plastic auto radio dials, 1300 pieces per hour, die cast escutcheons 700 per hour.

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It's sometimes more efficient to

Move The Trim Press To The Die Castings

LITEMETAL Dicast, Inc., is one of few die casting plants that confines its output to the light alloys based on magnesium and on aluminum. As in other plants, however, die castings always have flash along die partings and often in cored holes. This flash is removed, as a rule, by trim dies used in presses that, in this shop, are all hydraulic.

All of the presses have been provided with casters so that they can be moved readily and they are spotted at whatever location is most convenient. Often, it is much quicker and easier to move a press to a batch of castings to be trimmed than to truck bulky loads of castings to a press in some fixed location. Setup of a "line" in conjunction with other machines also is facilitated. Figure 1 shows one 4-ton Denison Multipress on a castered bench. In this particular setup, the press is used to remove flash from the outside diameter of a magnesium internal gear for a lawn mower.

In most setups, the operator must place both hands on operating levers both of which must be moved downward to close the press. This insures that both hands are in safe position away from the dies. In certain cases, however, when the operator must have one hand free for a special operation, one control lever is locked down. Then, operation is effected by a single lever.

In making setups, the die is merely clamped on the bed of the press and the punch is fastened to the ram. Then, the press stroke, which is controlled by stop collars adjustable vertically on a shipper rod back of the ram, is set to give the punch the required stroke and the desired clearance when elevated. As the stroke is variable

Continued next page

3. PARTING parallel to the axis requires careful trimming. Kerosene spray helps to prevent galling of the aluminum casting along step-faces.

By W. A. KAVANAUGH,
Vice President,
Litemetal Dicast, Inc.

9 10 11 12
Masks
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Continued next page

By W. A. KAVANAUGH,
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"Safety and efficiency are principal considerations in setting up this operation for removing flash"

4. FLASH-TRIMMING around periphery of this die casting is done in 6-ton Denison press as it pushes casting through the die. Chips fall on the conical surface and away from the die recess.

5. FINS ARE CUT from the flange diameter and a hole is cleaned in this gas regulator casting at a rapid rate. Like other presses in the plant, this one is mounted on casters for easy moving.

Trimming Die Castings—Cont.

and motion is confined to that portion of the maximum that is needed, the die can be thick or thin and no blocking or shimming is required.

Moreover, only that portion of the stroke needed is used and there is no waste motion as is often unavoidable in presses having fixed stroke. In addition, although the pressure setting used in this shop usually remains constant, it can be varied and set to any value up to maximum press capacity and then cannot exceed the pressure set. This nearly eliminates the chance of die breakage. Even if a casting is not set properly in the die, the die will not be injured and the piece may even escape injury because the maximum pressure set cannot be exceeded, where, on a positive press, a careless placing of the work piece may result in breaking the die or even the press.

It is also noteworthy that ram motion is at uniform speed and that the pressure is applied as gradually or rapidly as may be desired, but never with the impact that is characteristic of positive presses that give the ram a harmonic motion and can apply maximum pressure only at the end of the working stroke.

Typical setups of Denison presses are shown in all five photos. When flash needs to be removed only from a periphery and not from cored holes, a push-through die generally is used. If holes have to be cleared of flash or if some other condition makes it impossible or not desirable to use a push-through trim die, other types are employed. Each press is equipped with a die cushion that can be set to lift the casting free of the die if desired. Air jets that blow chips free of the die often are used and small castings often are ejected by an air jet.

Rates in flash removal vary somewhat with the size and shape of casting but often can be done at rates of approximately 30 pieces a minute or higher. In all cases, the time for stroking of the press is only a small part of the cycle time. Most of the time is consumed in loading the die and in unloading it, if an air ejector cannot be used.

Some of these presses have been in constant use since 1946 and maintenance charges thereon have been practically nil. This factor, in combination with the convenience of this form of press and other advantages mentioned above, contribute greatly to the highly satisfactory record that the presses have made in their application in this plant.

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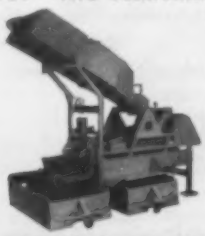

CHIP SEPARATOR AND GRADER

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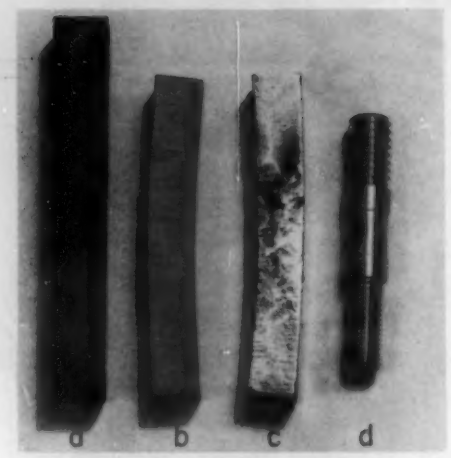
MORE USES for sintered tungsten may result from this . . .

New Method for Machining

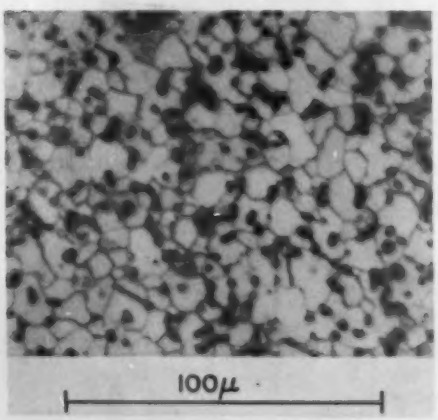
By ROBERTO LEVI
Philips Laboratories

TUNGSTEN, because of its very high melting point, low vapor pressure and high strength at elevated temperatures, to name only a few of its unique physical properties, is ideally suited for a large number of applications in both the laboratory and industrial fields. However, the potential applications of this metal have been greatly limited because of its almost complete lack of machinability, the only machining operations possible being restricted to grinding and slicing by high speed silicon carbide cutoff wheels: therefore, practically all of the applications of tungsten so far have been based on its availability in ingot, rod, wire and sheet form.

Attempts to fabricate high density tungsten parts of intricate shapes and close tolerances have not been very satisfactory. Such parts, depending on their size and shape, were preformed either by pressing tungsten powder in a die of the required shape, or by machining them from a partially sintered and very porous bar having a density of the order of 55 percent of the theoretical value for solid tungsten.



1. STAGES in forming: a) pressed and presintered tungsten ingot; b) similar ingot after high temperature sintering; c) copper impregnated sintered ingot; d) pure tungsten machined by turning, drilling, threading.



2. TUNGSTEN SURFACE, after removal of filler metal, is shown in this photomicrograph.

TABLE I
Characteristics of tungsten powder
Elutriation Analysis

Fraction No.	Percent	Equiv. Particle Radius
1	29	> 6μ
2	25	
3	11	
4	13	
5	22	< 2μ

Scott Density—68.4 grams per cubic inch.

Five Steps Are Required From The

1. *Tungsten powder* having the characteristics shown in Table 1 is pressed into bars at 2,000 Kg/cm² and presintered for twenty minutes at 1100°C Br to permit subsequent handling; its density at this stage is about 55 percent of the theoretical value.

2. *The ingots* are then sintered for twenty minutes at 2400°C Br in an atmosphere of cracked anhydrous ammonia. During this stage considerable shrinkage and warpage occur and the density of the ingot reaches a value of 83 percent — 84 percent.

3. *The sintered ingots* are next impregnated with copper at 1350°C Br for a period of not less than 10 minutes in the case of ingots having a cross section of ⅜" x ⅜": larger ingots require a longer impregnating time. The impregnation is

Sintered Tungsten

In the latter case, the particles, being very weakly bonded together, were torn out in clusters rather than cut during the machining operation and, therefore, smooth surfaces could not be obtained. Whether preformed by pressing tungsten powder in a die or by machining from a presintered ingot, the parts were then sintered to the required degree. During this final sintering operation, considerable shrinking and warping occurred, making it exceedingly difficult in most cases to attain the required dimensions.

The author has developed a technique[1] for machining tungsten ingots sintered to a high density, by which parts can be made in shapes and with tolerances comparable to those possible with steel or brass. Since the tungsten has been sintered to the required degree before machining, the problem of shrinking and warping is eliminated.

Basically, the technique consists of first infiltrating the fully sintered porous ingot with a metal which fulfills the following requirements:

a) At a temperature somewhat higher than its melting point, the metal must be capable of wetting tungsten and of penetrating the porous body by capillary action;

b) Both the infiltrant and tungsten should be mutually insoluble not only below but also above the melting point of the infiltrant and should form no alloys in the metallographic sense;

c) The metal should act as a lubricant during the subsequent machining step.

Gold, copper, and alloys of the two in all proportions appear to comply best with the above requirements.

The second step in the process is the actual machining of the infiltrated body. Since the infiltrant acts as a filler and as a lubricant, it will prevent the tearing out of particles, burnishing and extremely high tool wear which would otherwise occur.

Finally, the infiltrant is removed by volatilization, thus restoring the density and porosity of the machined part to the original values established for the tungsten during the sintering operation.

While the infiltration step is similar to that employed in the manufacture of certain types of electrical contact materials, its purpose, as we have seen, is quite different. Moreover, the successful practice of the entire technique imposes a number of additional requirements.

For example, the impregnation must be carried out with the greatest care, for if a small portion of the body is not properly infiltrated, breakage of the tungsten or of the tool may result. Furthermore, in order that the machined part retain dimensional stability, the tungsten ingot must first be sintered for a sufficient length of time at a

Continued next page

Tungsten Powder To The Finished Shape . .

carried out in a hydrogen atmosphere by placing the ingot horizontally on top of a weighed amount of OFHC copper, slightly in excess of the amount which can infiltrate the pores; for the case of an 83 percent dense tungsten body, a weight of copper corresponding to 8 percent to 10 percent of that of the tungsten will suffice. The temperature is slowly raised to a point slightly below the melting point of the impregnant and held there a few minutes to insure an even temperature distribution throughout the ingot. When the temperature is finally raised to 1350°C Br, the molten copper will penetrate the tungsten body from the bottom by capillary action, a process facilitated by the fluxing action of the hydrogen.

4. *After cooling,* the impregnated bar is machined with carbide or high speed steel tools and all normal machining operations are possible.

No tungsten grains can be detected under microscopic examination of a freshly machined surface since a thin copper film has smeared over the entire area. If, however, the copper film is chemically removed from the surface of the machined grains, the smoothness and flatness of the grains indicate that they have actually been cut by the tool and not merely torn out.

5. *Finally,* the copper is volatilized by heating the machined parts in a vacuum furnace at 1800 — 1900°C Br. The resulting parts under spectroscopic examination show only an extremely faint trace of copper, and measurements show that no shrinkage has taken place since the tungsten frame had previously been sintered at a much higher temperature, namely, 2400°C Br.

Look alike? Yes! — but what a difference in finishing costs. It cost a plumbing fixture manufacturer only $.0104 to finish the part on the right by Supersheen Speed Finishing. The part on the left cost $.25 to finish by former costly hand finishing methods. That's a saving of over 95% or $4,792.00 for 20,000 units. Supersheened finished parts maintained a much greater uniformity too.

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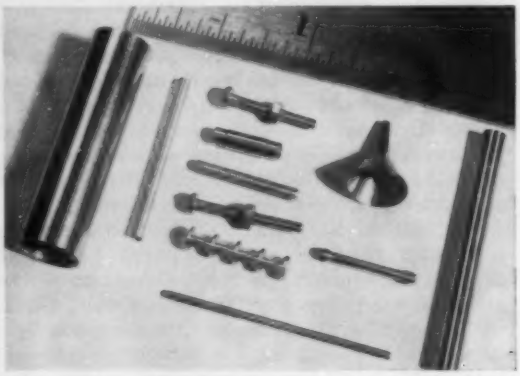
temperature considerably higher than the highest temperature to which it will be subjected during infiltration, evaporation of the infiltrant from the machined part or during the actual use of the latter in the application for which it was designed. Satisfactory results are achieved only by the proper combination of factors, such as characteristics of the tungsten powder, pressure used in forming the bars and dew point of the sintering atmosphere, inasmuch as these factors determine the sintering temperature required to attain the proper density.

The various stages of the technique are illustrated in Figure 1, while Figure 2 shows a photomicrograph of a polished section of a tungsten surface after removal of the copper.

In Figure 3 are illustrated some parts made by this technique. While all normal machining operations can be carried out with relative ease in the case of tungsten sintered to a density up to about 83 percent, further increases in density make the machining progressively more difficult, because of a rapid increase in the percentage of nonconnecting pores which cannot be infiltrated.



3. EXAMPLES of tungsten parts made by machining.

The technique described allows the fabrication of tungsten parts having a density up to slightly less than 90 percent of the theoretical value for solid tungsten.

The new technique permits not only the simple fabrication of high density parts to close tolerances with exceptional high temperature dimensional stability, but also the fabrication of extremely fine parts which could not previously be made either by pressing in a die or by machining the presintered ingot because of the inherent weakness of the material.

At present the process is used in making Philips dispenser cathodes of both the "L"[2] and "impregnated"[3] types for longer life electron tubes. It permits machining of their tungsten components to meet specifications that require accurate dimensions, porosity and gas permeability.

---

[1] R. Levi, U.S. Patent No. 2,669,008, Feb. 16, 1954.
[2] H. J. Lemmens, M. J. Jansen and R. Loosjes, "A New Thermionic Cathode for Heavy Loads", Philips Tech. Rev. 11, 341-350, 1950.
[3] R. Levi, "New Dispenser Type Thermionic Cathode", J. Appl. Phys. 24, 233, 1953.

(Advertisement)

A SPECIAL REPORT ON PROTECTIVE FINISHES FOR ALUMINUM

Most aluminum producers and fabricators are well aware of the superiority of chemical finishes over anodizing for the protection of aluminum from corrosion. Naturally, then, there is a running battle for acceptance among the leading producers of the protective chemical finishes.

That's why, here at Allied, we have always studied your needs with regard to both our own and competitive processes. We're constantly trying to produce new and better finishes because we believe there's always room for improvement . . . even to our own products. Some years ago this policy led to the introduction of a process, long in development, that offered you a way to overcome anodizing's obvious technical complications . . . Iridite #14. This finish was far easier to use than anodizing, yet provided comparable, if not superior, quality. And, its cost was much less than anodizing.

But other finishes offering similar advantages over anodizing have entered the market. So . . . the current battle for acceptance. By any cost comparison Iridite #14 is the most economical. However, corrosion tests by users show contradictory results as to performance from Iridite #14 and other leading protective finishes for aluminum. Most tests show Iridite #14 superior, but some do not. The margin of difference, however, is always small. The truth is that all have proved good. However, our laboratory research indicated that still further improvements could be made.

That knowledge . . . plus our aim to give you even better protection and maintain the leadership of the industry, is exactly why Allied Development Engineers have been working for long years to develop a better finish than any of those now available, including our own Iridite #14.

Now the new finish is ready for you. It's called Iridite #14-2 (Al-Coat).

From a performance standpoint, Iridite #14-2 gives you two important advantages in the protective finishing of aluminum.

FIRST: in its fully colored brown film stage it provides corrosion resistance decidedly superior to previous processes.

SECOND: the basic brown film can be hot water bleached to produce a clear-type film with protection heretofore unobtainable from clear-type chemical finishes.

From an operating standpoint, new Iridite #14-2 gives you three important advantages.

FIRST: it provides consistently higher corrosion resistance for different aluminum alloys treated in the same bath.

SECOND: it provides a more uniform appearance for parts of different alloys and with varied surface finishes before treatment.

THIRD: its operating and technical characteristics are superior to those of other processes.

If you are using or planning to use a chemical finish for aluminum, you should have full details on new Iridite #14-2. Write us or send samples for free test processing. Or, for more immediate advice, call your Iridite Field Engineer. He's listed under "Plating Supplies" in your classified telephone book. - - - ALLIED RESEARCH PRODUCTS, INC., 4004-06 EAST MONUMENT STREET, BALTIMORE 5, MARYLAND.

P. S. Even new Iridite #14-2 will be constantly measured against both your needs and competitive processes to make sure you get the best possible, most economical finish for your product that man and the laboratory can develop.

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MORE CONVENIENT... EASIER TO MAINTAIN... LOWER COST

Here's the newest addition to the HONITE line of barrel finishing machines! More convenient . . . easier to maintain . . . lower cost, yet it retains *all* of the same precision construction features of established DV-3 and DV-5 models. It's designed with your needs in mind. It meets the most rigid safety requirements. With the all-new HONITE Barrel Finishing Machine, you have a choice of three motors; the 1½ h.p., for normal applications, the 2 h.p. for all but the heaviest jobs, the rugged 3 h.p. for super heavy-duty requirements. Note that the motor, speed reducer, speed changer and magnetic brake are mounted as a single compact unit, located well away from water and dirt, and completely protected from accidental damage by hoist pans, hoists and swinging objects.

☐ Pivoted safety gate —no slides or rollers to stick or jam.

☐ All lubrication points are open and accessible.

☐ Handy height controls, switches and speed changer located at right side of barrel. No stooping — no stretching.

☐ Cylinder can be removed from the front without disassembly.

☐ Steel frame absorbs drive stresses without transmitting shock to supports.

☐ Oversize pillow blocks and self-aligning bearings carry full loads of steel burnishing media.

☐ Chain guard covers drive even when safety gate is raised.

☐ Shafts are jig-bored for cylinder mounting to insure alignment on axles within .005".

☐ Plenty of space under the barrel to speed unloading. Two hoist pans can be used if necessary.

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Peelable Plastic "Wrapping" Protects Precision Surfaces

THE precision finish developed at great cost on jet blading and other metal parts such as tools, dies, gages and small components, needs protection during handling, shipping and storing to prevent surface damage. A method of surface protection developed during wartime is now finding many uses for this type of protective "packaging" . . . the butyrate peelable plastic dip coating that becomes a skin-tight wrapper.

During the Korean war, about 2 million pounds of this peelable packaging was used per year by the Armed Services, and now peacetime applications have been found for the material, even though it was expected that the strippable coatings would be limited in application because: 1) they cost somewhat more than conventional wrapping materials, 2) they require an initial investment in a melting tank and compound, 3) they require a certain amount of skill on the part of the operator.

The fact is, wherever a defective surface finish can be cause for rejection, peelable coatings are more

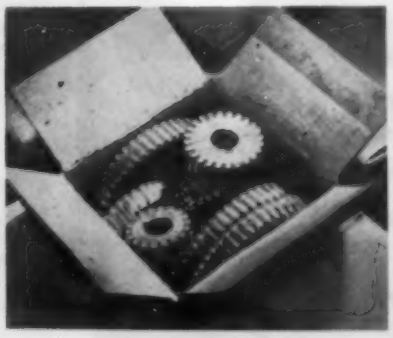
2 Ways To Apply Coatings

STRING TIE system is recommended for single dipping. After careful cleaning, a precision gear is immersed in molten plastic. The string will be clipped and sealed. Non-wicking string should be used to prevent entry of moisture.

MULTIPLE DIP system is an alternative method. Thoroughly cleaned part is held at one end while the other is submerged. When the coated end has cooled (about one minute elapsed time) the uncoated end is immersed so as to overlap the first coat by one inch, forming a perfect seal.

Features of Strippable Butyrate Coatings . . .

EASE OF IDENTIFICATION. Code numbers taped on before dipping can be read through transparent plastic coating.



BULK PACKAGING requires only an outside container. Plastic "overcoat" cushions each part against impact or abrasion.

PEEL LIKE A BANANA and the gear is ready for use. Plastic envelope can be saved, melted down and re-used.

than paying their way. Here, in capsule form, are the methods for applying, basic factors to consider in choosing this material, and some typical current applications.

How To Apply It

Developed by Eastman Chemical Products, Inc. of Kingsport, Tenn., during the war, the material is supplied in the form of plastic blocks by some ten suppliers across the country. The blocks are compounded of Eastman's cellulose acetate butyrate, dioctyl phthalate, certain resins and a rust inhibiting oil.

These blocks are placed in specially designed melt tanks, heated to about 350 F, which reduces the plastic to a thick, syrupy liquid. The piece to be packaged is simply immersed and withdrawn, leaving a tough film of plastic over the entire surface, from 0.05 to 0.1 inch thick. Film is removed by slit with a sharp stick and peeling like a banana.

Ten Factors To Consider

Following are some of the benefits of peelable plastic packaging that have recommended themselves to traffic managers, p.a.'s and similar expense-minded executives:

1. High flash point. (Butyrate's is 412 deg. F, with fire point 100 degs. higher).

2. Transparency (makes for easy reading of identifying marks and codes).

3. Easy stripping (even after prolonged periods of exposure, butyrate plastic peels like a banana).

4. Extraordinary stability (resists oxidation and contains no volatiles).

5. Positive fusion (secures absolute protection against moisture).

6. Resists humidity (test panels exposed to 100% relative humidity at 100 F. for 720 hours were free of corrosion after the protective coating was stripped off).

7. Tensile strength and elongation (over 450 lbs. per sq. in., with elongation of 120%, which helps to account for its resistance to abrasion and impact).

8. Plasticity (less than 25% compression under heavy load at 160-deg. F. with 99% longitudinal recovery).

9. High melting point (softens at about 190-deg. F; begins to melt at 225-deg. F).

10. Reclaimable (protective "overcoat" can be re-melted and re-used indefinitely).

As of this moment, peelable plastic is used widely for peacetime packaging or manufacture of:

Bearings
Brackets
Bushings
Cam Shafts
Connecting Rods
Cutting Tools
Fittings
Flanges
Gears
Highly Polished Tools
Knuckles
Liners
Micrometers
Meters
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ACME MFG. CO. EXPANDS

Acme Manufacturing Company of Detroit, Mich. announce an expansion of their plant facilities from 73,000 to 85,000 square feet.

The expansion was made necessary because of new equipment recently developed and the demand of industry for automated metal finishing equipment.

Aluminum Coating Protects Steel From Chemicals, Heat Corrosion

Protection of steel and its alloys from both chemical and elevated temperature corrosion can now be accomplished by metallurgically bonding pure aluminum and its alloys to the ferrous materials.

Commercially available for the first time, the new "Alumicoat" process has been instituted by the Arthur Tickle Engineering Works, Inc. under license from the General Motors Corp. patent.

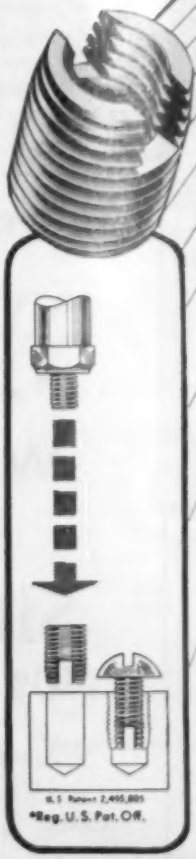
Cleaning of the surface to be bonded, by appropriate methods, is the initial step in the Alumicoat process. Areas that are not to be coated can be masked off. Next, the parts are fluxed in a salt bath and then immersed in molten aluminum for a few minutes to produce a metallurgical iron-aluminum alloy bond at the interface. The aluminum penetrates the steel to a depth of .0015 —0.001 and approximately .0005 — 0.001 aluminum clings to the outside as the piece is extracted from the bath. The thickness of the coating is determined by the material used and the length of time of immersion.

Pure aluminum or any of its alloys can be used for the coating material. However pure aluminum has been found to offer the best resistance to the attack of industrial gases and corrosive media, especially those containing sulphur compounds. Applications where both elevated temperatures and sulphurous acid were corrosive factors, have proved highly successful.

High temperature oxidation of mild or low alloy steels are reported to be stopped or materially reduced by the "Alumicoat" process. Tests have shown that adequate protection against oxidation is provided at temperatures at least as high as

Continued next page

THREADED FASTENERS need a firm grip, too!



U. S. Patent 2,495,805
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1. **No hole preparation other than drilling.**
2. **INSERT taps its own thread.**
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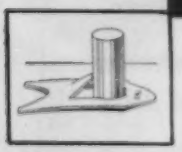

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- **No stud damage.** Resilient locking tab does not grip stud until final locking action at base. Less strain on studs—no metal "shavings" to impair full resilient locking.
- **Lock absolutely tight**—even on slippery chrome plated studs. Energized spring locking grip can not loosen or rattle.
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the base metal has useful strength. Temperatures ta which such tests have been made with 10w carbon steel have exceeded 1900 F.

At temperatures exceeding the melting point of aluminum, the aluminum diffuses into the steel forming an intermetallic compound of iron and aluminum. This diffused coating is well known as a refractory material and gives the steel maximum protection against high temperature sealing.

TABLE 1: How Much Protection . . . ?

Steel Samples	Temp. °F.	Time, hrs.	Change in weight*
Untreated 18-8 Chromium Nickel	1,350	24	—17.0%
Untreated 25-20 Chromium Nickel	1,350	4	— 8.3%
Untreated 27% Chromium Steel	1,350	24	— 8.4%
Al-coated Plain Steel	1,350	192	± 0.1%
Al-coated Plain Steel	1,700	192	± 0.1%
Al-coated Plain Steel	1,700	48	± 0.3%
Al-coated 18-8 Chromium Nickel	1,700	48	0.0%

*After corrosion scale was tapped off.

Table 1 shows some test data collected reflecting the protection given by aluminum dipping.

Low alloy or mild steels, aluminum dipped to give the required resistance to oxidation and corrosion, are now being used by design engineers to replace costly high alloy steels.

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News about
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New compound cuts die caster's chromate-finishing material costs

New Savings In Copper Plating

New addition agents for use with Unichrome Pyrophosphate Copper have eliminated buffing for many users, made it easier for others who prefer to buff copper rather than base metal or subsequent deposits. Plating speed has been increased — by as much as 20% in some cases. Need for expensive waste treatment is also being reduced because the bath contains no cyanide.

HELPFUL HINTS
by "Mr. Cost Cutter"

One of the finest coatings for dipping baskets is provided by vinyl plastisol compounds because their heavy, resilient build-up prevents scratching of parts. Platers now using Unichrome Coating 218X for racks have one of the finest plastisol formulations available for these baskets, too. This coating withstands all cleaning and plating solutions and provides superior service in vapor degreasing cycles!

Round anodes cut chromium plating current needs

Using conventional flat anodes, one plating plant took 2 hours to get the required deposit on work loaded 108 pieces to the rack. Switching to the special alloy cylindrical anodes originated by United Chromium cut the time almost 17%. Unichrome Round Anodes deliver more current per unit of surface area without overheating or warping.

IN SWITCHING from a liquid chromate material to the newly developed "dry" Unichrome Dip 1081, a well known producer of zinc base die castings is collecting a big dividend.

A yellow finish is being produced that fully meets specifications for corrosion resistance the same as before. Yet cost of materials consumed is *40% less* than before — with *further* savings found in reduced shipping expense. Unichrome Compound 1081, as a dry compound, can be transported more economically in easy-to-handle metal containers, instead of troublesome, crated carboys.

ZINC FINISHING IS PRACTICAL

Chromate treating remains one of the most widely used ways of finishing zinc die castings or zinc plated steel. It fortifies corrosion resistance, is as easy as it is economical, and has had the quality and durability of the finishes well proved by time.

With such a combination of plus-features offered, it pays to learn whether chromate treating can satisfy existing finishing requirements.

United Chromium offers an unusually wide line of chromate finishes. With wide choice, it becomes possible to find a dip solution that means improved quality, greater material economies, or production economies.

GOOD COLOR CHOICE

Colors which can be produced with one or another of the Unichrome Dip solutions range from chromium-like clear, through gold, brass color, yellow, olive drab, to black. Unichrome chromate finishes also satisfy production method requirements with compounds for manual, semi- or full-automatic operations.

Write for more information.

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TEST BARS
continued from page 52

relatively sound structures with high mechanical properties, exceeding the 30,000 psi value. Progressively as the test bar diameter increased to ¼ inch to ⅜ inch and finally to ½ inch, the mechanical properties decreased rapidly. The ½ inch diameter test bar had the poorest values.

Subsequent metallographic examination of the test bars clearly indicated that there was very extensive inter-dendritic porosity due to the hydrogen, the condition being worse for the larger diameter test bars, resulting in severe notch effects which gave the low mechanical properties. A thoroughly de-gassed melt resulted in only a very small difference in properties among the various diameter test bars.

Case 3: The casting of 304 stainless steel in which a 100 percent austenitic structure does not result, in spite of the fact that the composition is correct to yield a 100 percent austenitic alloy.

This is a difficulty due to delta (alpha) ferrite formed during solidification. In the case of forged steels of this same composition, the high temperatures and extensive hot working tend to homogenize the alloy, and thereby eliminate the delta phase. This is an instance where phase transformations have not gone to completion due to segregation, and the problem becomes more severe as the section size becomes larger or as the solidification and cooling rates slower.

Heat treatment is not a sure way of eliminating this difficulty, since it takes extremely long times to decompose the delta ferrite phase to produce a homogeneous austenitic alloy. Thus, one should be forewarned that the casting of a small diameter test specimen would not serve as a measure of the structure and properties of a considerably larger casting where the casting conditions are likely to be very different.

Case 4: The casting of tool steels. Here, carbide segregation is a very important factor. The larger the size of the casting the greater the tendency for severe carbide segregation in the center of the casting where the solidification rate is the slowest and the ejection of carbon the most severe.

A small diameter test bar or a small diameter casting would surely not be a measure of the structure or properties of a heavier section in this particular instance. In addition, there is the problem of decarburization and also of deoxidation in evaluating a casting by means of a test bar or a test specimen.

These, then, are instances which illustrate some of the many difficulties which are encountered regularly in utilizing testing or sampling procedures to evaluate castings.

We find ourselves back at the point where we must realize that each specific case may have to be handled separately, utilizing to the best of our ability the metallurgical and foundry knowledge which we have gained through experience and through training in order to properly evaluate the casting by means of testing procedures.

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adds the "TOUCH of GOLD" that steps up production and profits

In Norton ALUNDUM B abrasive you get a truly all-purpose polishing grain, expertly engineered to cut costs and improve product quality "across the board" in your polishing operations. Here are some typical advantages that mean top performance in every set-up:

- *Uniform grain shape,* the result of careful processing that eliminates flats and slivers, leaving only solid, blocky grains that stand up better and polish faster.
- *Uniform grain sizings,* with no oversize grains that mar the finish, no undersize grains that skip their share of work.
- *High capillarity,* assuring the easy absorption of adhesive that means longer lasting, better performing set-up wheels.
- *Usable with cement or glue,* it is equally firm-clinging and efficient with either.
- *Made in all grit sizes* from 20 through 240, to cover the widest range of polishing jobs, from roughing to fine finishing.

See your Norton Distributor

for prompt deliveries of Norton ALUNDUM polishing abrasive. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

Finishing With The "Touch of Gold". In the finer grit sizes ALUNDUM B abrasive is unequalled for the polishing that means better looking products.

Roughing With The "Touch of Gold". ALUNDUM B abrasive in the coarser grit sizes, removes stock faster, saves time and money.

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NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

For more information circle No. 68 on the Reader Service Card

OPPORTUNITIES

Rates: $20 for the first column inch, $15 for each additional inch.

WANTED — All types of die casting machinery, late or old, small or large. Barr Machinery Company, 817 West Lake Street, Chicago, Illinois.

MACHINE DESIGNERS — Die Casting Equipment — As a result of an expansion program of large Midwestern Machine Tool Manufacturer, engineers experienced in die casting machine design and development are needed. Top job available for right man. Write Box 3155 PRECISION METAL MOLDING magazine.

SALES ENGINEER — Die Casting Equipment — Large established manufacturer of die casting machinery wants sales engineers experienced in die casting process and equipment. Write Box 3255 PRECISION METAL MOLDING magazine.

DIE CASTING ACCOUNTS — Established Mfg. Rep., casting & forging specialist, Philadelphia office, due to many customer requests seeks quality die caster to rep. in N. J., Pa., Dela., Md. Excellent contacts in aircraft, electronic, automotive, appliance fields. Write Box 3355 PRECISION METAL MOLDING mag.

CASTING LINES WANTED — By experienced Manufacturer's Representative — Chicago area. Calling on major manufacturers' in varied lines. Straight commission basis. Write Box 3455 PRECISION METAL MOLDING magazine.

MANUFACTURER'S REPRESENTATIVE — in New England territory with four men interested in representing a manufacturer of powdered metal parts that are being used by manufacturers of electrical and mechanical units. Territory covered for approximately 25 years. Write Box 3555 PRECISION METAL MOLDING magazine.

SALES EXECUTIVE — In large iron powder producing company — experience in powder metallurgy preferred. Qualifications must be stated in detail and will be treated strictly confidential. Hoeganaes Sponge Iron Corporation, Taylor Lane & River Rd., Riverton, N. J.

SALES REPRESENTATIVE WANTED — in New York and Philadelphia areas by established firm in the zinc die casting field. Please send all information in first letter concerning territory covered, selling and engineering experience and other lines carried. Write Box 3655 PRECISION METAL MOLDING magazine.

WANT TO PURCHASE: Modern, good, used 400 - 600 ton aluminum die casting machine. D. J. Vogel, 136 East Ocotillo Rd., Phoenix, Ariz.

MANUFACTURERS' REPRESENTATIVE— All territories open — Eastern manufacturer specializing in die casting and stamped parts for aluminum windows and doors. Contracting also done in many other fields. Good commission. Write R. L. Dagne, Master Fabricators, Inc., 178 Casper St., Valley Stream, N.Y.

ERROR IN AUTHOR CREDIT

The February issue of PRECISION METAL MOLDING magazine carried the article "Can Sintered Steel Be Evaluated from Machined Blanks?" Editorial error credited authorship to Dr. Gerhard Zapf of the Metal Powder Dept., Husqvarna Vapenfabriks. The author of the article is:

Ivan Ljungberg, assistant head
Metal Powder Dept., Husqvarna Vapenfabriks
Aktiebalog, Husqvarna,
Sweden.

We regret this error and express our apologies to Mr. Ljunberg.

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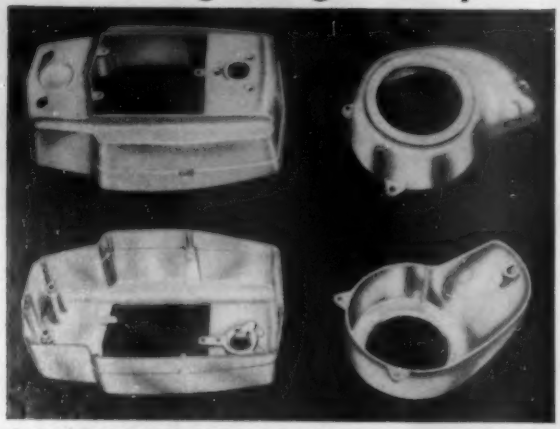
For more information circle No. 84 on the Reader Service Card

Here's one "Cover-Up" you can't lose on—

ENGINE HOUSINGS
Smoothly Die Cast from Lightweight Alloys



As in the photograph above, Die Castings in smooth, lightweight alloys make ideal Housings, Shrouds and Covers for your Machines. In addition to providing eye-pleasing merchandisable covers, they provide, importantly for the manufacturer, mounting bosses, lugs and cored holes.

Power Products Corp., a major supplier of lightweight engines for power equipment such as: lawn mowers, chain saws, generators and pumps, looks to LITEMETAL for a dependable supply of shrouds for their engines. In addition to the great savings in weight afforded by die castings of aluminum and magnesium, important cost savings are effected through the virtual elimination of machining, finishing and assembling. If you have a "Cover-Up" or any other job that the use of lightweight die castings can fill, look with confidence to LITEMETAL DICAST for meeting your needs.

Let's Talk It Over . . .

LITEMETAL DICAST, INC. is an organization of specialists — men thoroughly experienced in the casting and machining of magnesium and aluminum alloys. Our equipment includes big machines for big jobs — little machines for little jobs . . . the right sizes and types of the most modern die casting equipment for producing parts from the size of a button to large cable spools. Complete facilities for secondary operations are also available.

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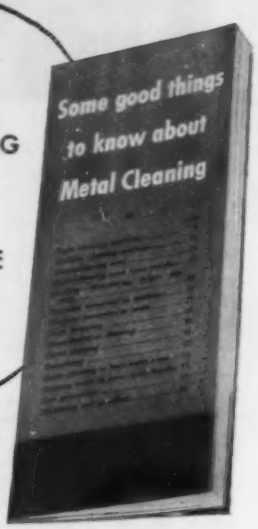
For more information circle No. 36 on the Reader Service Card

WHICH METAL-CLEANING JOBS WOULD YOU LIKE TO IMPROVE?



Listed below are some of the operations discussed in Oakite's 44-page handsomely illustrated booklet on Metal Cleaning. Please check the list. Then let us show you how Oakite methods can give you better production with greater economy.

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- ☐ Electrocleaning
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- ☐ Zinc phosphate coating
- ☐ Paint stripping
- ☐ Steam-detergent cleaning
- ☐ Barrel cleaning
- ☐ Burnishing
- ☐ Rust prevention
- ☐ ALSO send me a FREE copy of your booklet *"Some good things to know about Metal Cleaning"*.

Name _____

Company _____

Address _____

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USEFUL LITERATURE CATALOGS, MANUALS

to get any of the free materials described here, circle the appropriate number on the reader service cards bound into this issue

PROCESSES

Brass Powder Applications: 144
The latest issue of the Metal Powder Press, a publication of New Jersey Zinc Co., describes and illustrates some of the many uses of brass powder in making parts by the powder metallurgy process.

Metallic Friction Materials: 145
Two brochures are available from The General Metals Powder Co. which describe a few of the many applications of friction materials made from metal powders.

Investment Cast Wear Parts: 146
The use of Haynes Stellite Alloy No. 6 for investment casting wear parts is described in a recent issue of Haynes Alloys Digest, a publication of the Haynes Stellite Co.

Nickel Base Alloy Castings: 147
A new 15-page booklet has been issued by The International Nickel Co., Inc. describing some of the nickel base casting alloys and illustrating applications with actual casting photos and data.

Aluminum Bronze Castings: 148
The advantages of permanent mold aluminum bronze castings are outlined in a colorful, illustrated brochure offered by Bronze & Steel Die Casting Co. Also included are: specs for this alloy; application examples; data on properties.

Investment Casting Booklet: 149
Design tips and metallurgical data highlight a new eight-page booklet published by Casting Engineers, Inc. Guides on tolerances, wall thicknesses, threads, etc. are given, as well as a description of the company's production facilities.

Die Castings in Three Alloys: 150
Die castings in aluminum, magnesium and zinc are the subject of a booklet offered by Paramount Die Casting Co. who die cast alloys of all three metals. Typical castings, plant views and background information are included.

New Die Casting Facilities: 151
With the opening of its new die casting plant, Lester Castings, Inc., has issued a 4-page brochure showing views of its facilities for producing die castings, photos of key personnel, and illustrations of castings being made.

Permanent Mold Or Die Castings: 152
In a 6-page illustrated brochure from Eastern Casting Corp., the designer and buyer of aluminum castings is offered a source for either permanent mold or die castings. Of particular interest is a page giving dimensional tolerances for both types of castings. Also, the brochure includes a 4-color view of the foundry, many illustrations of company facilities, and a page showing some castings produced by the company.

MATERIALS AND EQUIPMENT

Proportional Mixer for Burners: 153
Bulletin L-700 has been published by Eclipse Fuel Engineering Co. which describes the new Vari-Set Proportional Mixer with Adjustable Jet. Complete data and information together with a selector chart are included.

Graphite Parting Compound: 154
The Acheson Colloids Co. has prepared bulletin No. 427 which describes and gives application data on the use of colloidal graphite as a parting agent.

Grinding, Honing & Machining Service: 155
A brochure describing the facilities and equipment available for precision machining, grinding and honing has been issued by Martin Grinding & Machine Works, Inc.

Casting Impregnation: 156
The impregnation of castings and the equipment for impregnation of castings is described in a brochure available from Multiplastics.

Standby Protective Systems: 157
How to minimize possible production losses due to unavoidable interruptions to fuel gas, prepared atmosphere and power supply is told in the latest issue of Heat Treat Review, published by Surface Combustion Corp.

Molybdenum Disulfide Lubricant: 158
The use of molybdenum disulfide as a lubricant is discussed in two field reports, Nos. 136 and 138, that have been published by the Alpha Corp. The same company has published a 4 page report on lubrication with solid lubricants.

Pyrometric Supplies: 159
Catalog No. 6 by Arklay S. Richards Co., Inc. gives a listing of the complete line of thermocouples and thermocouple supplies stocked by that company.

Die Castings & Die Casting Machines: 160
News about applications of die castings and die casting machines is reported in the Lester Press, a regular publication of Lester-Phoenix, Inc.

Manufacturing on Presses: 161
A 24-page, multi-color catalog has been issued by Denison Engineering Co. which describes and illustrates the multitude of manufacturing jobs that can be done on the company's hydraulic presses.

Soft Metal Melting: 162
A guide for the proper selection of heating equipment and control for soft-metal melting has been published by the General Electric Co. Bulletin No. GEA-6113 shows the steps to be taken in selecting cast-in immersion heaters.

Gas Purity Analyzers: 163
Gow-Mac Instrument Co. has issued a descriptive sheet on their high sensitivity gas analyzer.

Carbide Cutting Tools: 164
Selecting the proper grade of cemented carbide for use as a cutting tool for a particular cutting job is the subject of a new 24-page booklet that has been issued by Carboloy.

High Strength Aluminum Alloy: 165
A folder giving all of the properties of Tenzaloy — a room temperature age-hardening alloy — has been published by the Federated Metals Div. of American Smelting & Refining Co. Physical properties, mechanical properties and aging curves for both sand and permanent mold castings are given.

Mechanical High Vacuum Pumps: 166
A four-page catalog, No. 400, has been issued by the Kinney Mfg. Div. of The New York Air Brake Co. The catalog gives complete operational data on these pumps.

Aluminum Casting Alloys Handbook: 167
An illustrated, 60-page handbook has been announced by Federated Metals Div., American Smelting & Refining Co. It covers metallurgy and casting practices, plus handy cross-referencing of all important (Federal, Navy, SAE, AMS, ASTM) specifications for die casting, permanent mold casting and sand casting alloys.

Induction Melting: 168
Inductotherm Corp. offers a brochure describing its line of induction melting and heating equipment. As a selection guide, the folder includes tables, performance tables on all models, from one to 1,000 pounds-per-hour capacity.

Porosity In Aluminum Castings: 169
A booklet offered by George Sell Metals Co., Inc., cites recommendations for minimizing porosity in aluminum castings. The article suggests operational methods by which foundrymen can produce intricate castings to meet specs.

Continued next page

SHELL MOLDED CASTINGS . . . CLOSE TOLERANCES WITHOUT MACHINING

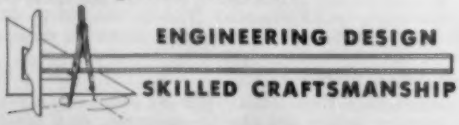
IN ANY ALLOY

MAGNESIUM
ALUMINUM
COPPER
BRASSES
BRONZES
CAST IRON
STEEL (All Alloys)

Smooth Sharp Surfaces

Any alloy that can be cast in sand can be shell molded—and with far sharper surface detail and closer tolerances under normal conditions. For example, tolerances in the range ±0.003 to ±0.005 can be regularly maintained, but it is only good judgment to consult us on each design to be shell molded. What's more, excellent as-cast finished (100 rms on ferrous alloys . . . even better on non-ferrous) reduce and in many instances completely eliminate machining costs.

It will pay you to check on shell molded castings for your parts. And when you do, check with Shell Castings Inc. One of our foundries in strategic industrial areas is sure to be near you. Contact Shell Castings, Inc., P. O. Box 782, Erie, Pa. We'll be glad to consult with you . . . at no obligation, of course.



For more information circle No. 51 on the Reader Service Card

Useful Literature — Cont.

Steel Powder Data File: **170**

Complete engineering data on Vasco 4650-A steel powder are combined in Bulletin No. 4 available from Vanadium-Alloys Steel Co. In addition to tables giving typical composition, sieve analysis and properties of the prealloyed powder, this bulletin shows typical applications and properties of high strength steel parts.

FINISHING

Abrasive Grinding Manual: **173**

Behr-Manning Corp. compiled 21 technical papers into a 60-page manual of grinding and polishing with coated abrasives. This production digest, the product of two years' writings, is liberally illustrated. Typical chapter headings include: How To Convert A Polishing Lathe To Use Abrasive Belts; Eight Ways To Cut Costs; Tumbling And Countersinking By Abrasive Belt; Production Installations.

Plating Equipment Newsletter: **174**

Recent developments in plating equipment and materials are featured in Bart-Messing Corporation's monthly newsletter. Along with product specs and descriptions, the newsletter gives complete, up-to-date price lists on all types of plating department equipment.

Coated Abrasives: **175**

The story of coated abrasives, their manufacture, selection and use, is detailed in a 15-page booklet published by Armour & Co. The narrative is presented largely in picture-story treatment.

Machining The Unmachinable: **176**

How to machine and cut such hard-to-work materials as cemented carbides is the subject of a brochure announced by Sheffield Corp. It describes the Sheffield-Cavitron, an ultrasonic machine tool.

33 YEARS

"BETTER THAN EVER"

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STANDARDIZED PINIONS and RACKS

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DIE CASTING PERMANENT PLASTIC MOLDS

Standard sizes of Peerless "Flame Hardened" Ejector Racks and Pinions are available for prompt shipment. Special sizes may be produced to your specifications.

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Polishing, Grinding Equipment: 177
Two brochures published by Leiman Bros., Inc. describe the latest improved line of polisher-grinder-dust collectors for light metals, jewelry, etc. and sandblast machines.

Diamond Compound: 178
A data sheet giving the specifications and properties of a new diamond lapping and finishing compound has been prepared by Anton Smit & Co.

Barrel Finishing Manual: 179
The basic steps in barrel finishing are given in a 10-page manual recently released by Minnesota Mining & Mfg. Co. Included are specific recommendations for barrel speeds, water level, time cycles and barrel loading.

Precision Liquid Blast Finishing: 180
A new 17-page booklet describes and illustrates Pangborn's Liquamatte wet blasting. The principles of the process and numerous case history applications are given.

Selective Metal Stripping: 181
A four-page brochure has been issued by Enthone, Inc. describing their selective metal strippers. Methods of removing nickel from steel or copper, tin or tin-lead from copper or steel, etc. are given. A chart is included to enable easy selection of the proper stripper for any job.

Precision Cleaning & Finishing: 182
An 18-page booklet presenting 40 most frequently met applications of wet abrasive blasting has been prepared by American Wheelabrator & Equipment Corp. One section of the booklet describes the process in detail.

Spray Masks & Mask Fixtures: 183
A new booklet on spray masks, fixtures, washers, etc. has been published by Finish Engineering Co., Inc. Examples of many different types of masks are given and some of the spray machines are illustrated.

Continued on page 84

For more information circle No. 43 on the Reader Service Card

ELIMINATE SMALL PARTS MACHINING

Five small parts of this machine are plaster mold castings of OPC #40 bronze. Held within specified ±.005" tolerance, they require no finish machining — that's OPC accuracy and smoothness. The "teeth" on the underside of Part D are cast to match the thread of the screw feed — that's OPC preciseness of detail. We'd like to help solve your small parts production problems the same way!

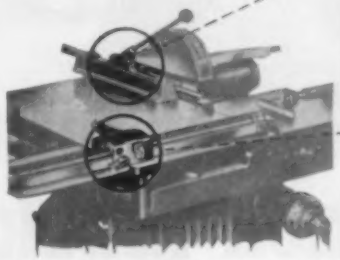

Photo courtesy Hammond Machinery Builders, Inc.

WRITE FOR BROCHURE
Illustrated case histories of savings made by using OPC castings, packed with helpful information.

OPC

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Plaster Mold Castings made from
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ZAMAK (Zinc Base) DIE CASTING ALLOYS

Once you taste the difference between ordinary alloys and H. B. & S. you'll never have an appetite for anything but HENNING products.
We strap Zinc Base Die Cast bars on metal pallets of the same alloy to speed handling in your plant. H. B. & S. alloys meet all Government; ASTM and SAE specifications.
Shipments made promptly by truck or carload lots from our own private railroad siding.

(On that next order specify HENNING and be convinced of the difference.)

Are you receiving our monthly publication THE HENNING MESSENGER? We believe it will give you a chuckle or moment's relaxation during a busy day. Ask to be put on our mailing list.

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DEPENDABLE SERVICE SINCE 1922

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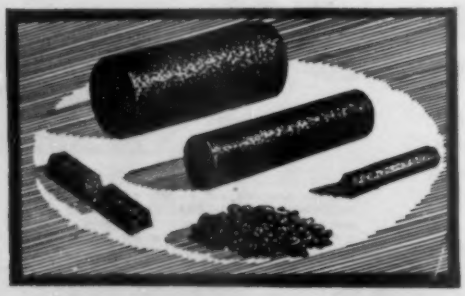
You can't beat Cannon-Muskegon MasterMet alloy service

...for fast delivery of standard or custom certified* alloys for remelt or reprocessing!

CANNON-MUSKEGON regularly produces a wide range of certified alloys to maintain one of industry's finest stocking programs. Immediately available are stainless steels in the 300 and 400 series *plus* certain carbon steels.

Service on "special" alloys is remarkable too!

Preparation is begun immediately after your specifications are received. You get *exactly predictable* physical, chemical and electrical properties to your specific requirements. And, depending upon the form you order, alloys can be cast, forged, extruded and machined. Furnished regularly to investment casting foundries and other users are alloy tool steels, ferritic and austenitic stainless, alloys of cobalt and nickel-base, plus aeronautical-types for extreme high temperature applications.



MasterMet alloys are available in ingot, shot, billet or short (6" dia.) cast bar forms and are normally shipped in drums. Specifications, weight, lot and customer's order number are clearly imprinted on container, making selection and storage a simple matter.

*Cannon-Muskegon furnishes notarized certificates of analysis to meet prescribed metal specifications. For more information about this, and complete technical service, write for New MasterMet Bulletin.

Cannon-Muskegon
CORPORATION
2871 Lincoln Street
MUSKEGON, MICHIGAN

MASTER MET

METALLURGICAL SPECIALISTS

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ROTARY TABLE
. . . cuts set-up time for die milling

Claiming to cut set-up times on simple jobs as much as 50 percent and on more complex jobs by as much as 90 percent, a new rotary type table for use on milling machines is now available. It is especially adapted for milling work on die casting dies and similar tooling.

Through the use of this table highly detailed work may be performed accurately and economically on most standard vertical milling machines, according to the manufacturer. In actual use, the work piece is located and clamped on the 11 inch square top cross slide and is never moved until all work has been completed, regardless of the number of operations or the type of operation performed.

Advance Products
For more information, circle No. 197 on the Reader Service Card

SHELL CORE BLOWER
. . . speeds up operations

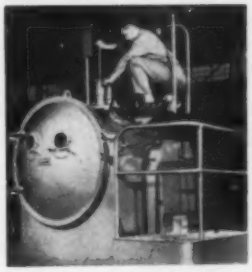
A new core making machine, recently shown, is said to increase the speed of foundry operations over gravity type shell core machines. The new machine can use either gravity or standard core-blowing techniques. It is similar in operation to conventional core blowers, except that the core box is heated and phenolic resin is used instead of conventional core binders.

Completely cured shells, ready for setting, are produced at a rate of one core every 30 to 50 seconds, depending upon the wall thickness desired, the company stated. With multiple cavity core boxes, the production rate is proportionately higher. The core is completely cured in the heated core box. This eliminates most of the handling operations, drier plates and core ovens.

Shaico Engineering Corp.
For more information, circle No. 283 on the Reader Service Card

PRODUCT NEWS AND DEVELOPMENTS

to get any of the free materials described here, circle the appropriate number on the reader service cards bound into this issue



VACUUM FURNACE . . . for moderate sized melts

A new, moderate sized vacuum melting furnace has been introduced, designed for melting moderate-sized charges and for laboratory work. Capacity is 50 lbs. of steel, or a corresponding weight of other metals.

The new furnace is a horizontal cylinder, 4 ft. in diameter by 4 ft. long. A full-opening hinged door gives complete, convenient access to the interior of the chamber when necessary. The entire chamber, including the door, is water jacketed. Conveniently placed sight glasses are fitted into the wall of the chamber to permit observation during the progress of melting and pouring.

Located in the upper portion of the chamber is a 3 in. full-opening vacuum lock which contains the bucket to hold, and add alloying materials to the melt. Emptying of the bucket, moving the crucible cover, dipping and raising the sampler, tilting of the crucible and rotation of the mold table are all actuated mechanically by manual controls from outside the chamber. Pre-heating and cooling molds is also accomplished from outside the chamber without breaking the vacuum.

F. J. Stokes Machine Co.
For more information, circle No. 280 on the Reader Service Card

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WAX INJECTION MACHINE . . . is bottom operating

A new wax injection machine for investment casting patterns is said to incorporate several improvements.

The wax injector is of one-gallon capacity and maintains the wax at an accurate and steady temperature. The unit is designed to take 10 lbs. pressure which is said to give excellent wax impressions when using rubber molds.

Injection is from the bottom of the container which prevents the machine being spoiled by the wax as may occur with top and side injection.

W. J. Hooker, Ltd.
For more information, circle No. 286 on the Reader Service Card

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DIE CASTING MACHINE . . . has infinite shot cylinder adjustment

Introduced a year ago and in continual use since then, a new cold chamber die casting machine for aluminum, brass and magnesium is reported to have high casting rates with good operator safety.

The machine is powered with a 20 HP motor and uses a Vickers pump. This combination provides ample rate of oil flow at pressures required for both the die closing ram and the injection cylinder.

Other features of the machine are the extra heavy framing and platens, strong tie rods, smooth, fast clamping action and a minimum pressure over the entire locking mechanism is made extremely heavy to insure maximum pressure over the entire platen area to withstand any injection pressures that are developed. The locking mechanism is nominally rated at 600 tons.

The injection assembly is designed and constructed to permit safe, speedy and efficient ladling of metal into the chamber. The shot cylinder is easily and infinitely adjusted to 6 in. below center when desirable. A three stage nitrogen accumulator assures maximum injection pressures and speeds. Speed of adjustment is a highlight.

Midwest Machine Co.
For more information, circle No. 198 on the Reader Service Card

Continued on next page

For more information circle No. 13 on the Reader Service Card

ALL NEW! THE FIRST COMPLETELY AUTOMATIC INDUSTRIAL INJECTOR FOR WAX OR PLASTICS

ASSURES INCREASED PRODUCTION

Injecting at pressures up to 1500 PSI the new "3C" INDUSTRIAL INJECTOR cuts production cost of wax patterns through more accurate and speedier operation.

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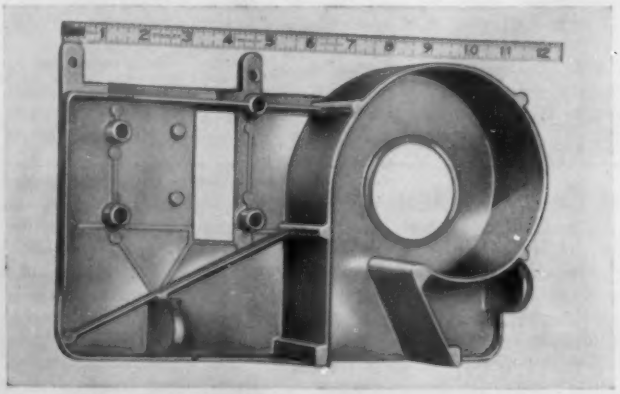

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FEDERAL DIE CASTING CO.

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PHONE ARmitage 6-4803

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VITREOUS ENAMELING PROCESS
. . . on aluminum castings

The development of a process for vitreous enameling aluminum castings has been announced.

According to a company official, the new process gives castings enhanced color appeal and can add new sales drama to many products. Through the use of inert pigments, light-fast colors retain their beauty and resistance to stain and discoloration.

Functionally the new enamels add much to surface protection; they have all of the inertness of glass. The enamel has excellent thermal shock resistance, salt water corrosion and abrasion resistance. The thermal insulation of the coatings is a major help in control of heat distribution the company says.

Machining, welding and a variety of other operations can be performed on the enameled castings without undue damage or discoloration.

Monarch Aluminum Mfg. Co.
For more information, circle No. 199 on the Reader Service Card

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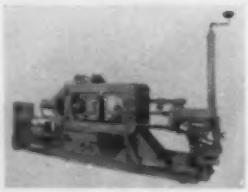
DIE CASTING MACHINE
. . . gives increased production



Designated as the HP-3X-SF, a new 600-ton die casting machine that will handle up to 16 pounds of aluminum per shot, or a proportionate amount of magnesium or brass, has been introduced.

The machine provides 33,200 psi maximum pressure on the metal. Both shot speed and pressure are adjustable, with an ASME approved nitrogen accumulator giving high speed injection. A shot position allowing 6" of adjustment is combined with a device which hydraulically elevates the entire shot system.

The die opening is 14", and the movable platen, completely unobstructed, is 40" wide, with a vertical clearance between the beams of 28¼". A 26" x 42" opening in the top of the frame

means the die space is accessible from all sides.

Lester-Phoenix, Inc.
For more information, circle No. 196 on the Reader Service Card

---

UNIVERSAL STAINLESS . . . for investment casting

New techniques of close control have made possible production of a stainless steel composition that meets a wide variety of specifications. These Master Alloys are refined, pre-alloyed metals for investment castings.

The new Universal stainless steel is now being produced as shot, and in two sizes of small ingot.

According to the producer, the use of this new steel will allow the investment caster to simplify inventory without loss of ability to service customers.

The new steel meets the specifications set up by such groups as: Iron & Steel Institute, Aeronautical Material Specifications, SAE, ASTM and Alloy Casting Institute.

WelMet Engineering Co.
For more information, circle No. 201 on the Reader Service Card

For more information circle No. 54 on the Reader Service Card

When You Think of *Aluminum Ingot* THINK of S-G

The sign, S-G, on aluminum ingot means aluminum of uniform quality made to meet the most rigid chemical and physical specifications. Whether it's for permanent mold, sand or die cast you can be sure with S-G ingot.

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"RINGS and SHAPES Since 1921"

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STRIPPING NICKEL & CHROMIUM
. . . without harming copper base

A new inhibitor has been developed for addition to acid baths used in stripping nickel and chromium plates from copper base metals. Through the use of the newly developed material, defective plating can be stripped from the base metal without injury to the copper, brass or other copper base alloy base metal so that immediate refinishing is possible. Previous strippers, a company spokesman says, so badly attacked the base metal that the part had to be completely refinished to eliminate etching pits prior to replating. In many cases, he added, attack on the base was so severe that the part was damaged beyond reclamation.

Enthone, Inc.
For more information, circle No. 202 on the Reader Service Card

RAMPE MFG. INCORPORATES

After operating for eight years as a partnership, Rampe Manufacturing Co., 3320 St. Clair Ave., Cleveland 14, Ohio, have incorporated their business.

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Fire Resistant Hydraulic Fluids For Die Casting - Part 4

IS THE COST of fire-resistant hydraulic fluids too high for economical use in die casting machines? No, say these die casters, who have developed an efficient method of reclaiming the fire-resistant fluid in their six machines.

WHAT is the difference in operating cost between a fire-resistant hydraulic fluid and a petroleum based fluid?

This is a question that more and more metal molding plant managers are asking as they consider switching to fire-resistant fluids. For in spite of the demonstrated value of such a fluid where there is a danger of fire, an understandable reluctance to change to a higher priced fluid exists in these days of keen competition and economy.

Nevertheless, many managements are making the change, and undoubtedly many more will, as the expanding use of hydraulics pushes harder against the limits of petroleum based fluids. A fire-resistant fluid is consistent with industry's long-time effort to increase job safety and improve production efficiency. There is evidence, too, that as the use of such fluids becomes widespread actuarial findings will point to a reduction in insurance rates.

At any rate, the answer to the question, in many instances, has been that the difference in real cost between a fire-resistant fluid and a petroleum base fluid is surprisingly small. If it is not exactly a case of having their cake and eating it, too, most plant managements are pleased to learn that with a little extra care and investment, it is possible to reduce new fluid requirements to the point where make up costs are comparable with oil. Both leakage control and reclaiming are necessary to accomplish such results. The careful choice of a fluid will pay dividends.

How the single factor of fluid reclamation affects the real cost of synthetic fire-resistant fluids is illustrated by the experience of Hardy Manufacturing Company, Union City, Indiana.

One of the largest companies in the highly competitive automotive parts field, Hardy tried Pydraul F-9* in mid-1953 at the suggestion of their insurance underwriters after several fires which only quick action prevented from doing great damage. Its reclaimability weighed heavily in its favor.

In August, 1953, when the company activities were consolidated in new quarters at Union City, the synthetic fluid was installed in all of its die casting machines: two Reed-Prentice No. 1-½ and four Cleveland, No. 400.

In the first year, total new fluid requirements was one drum a

*Reclamation procedures described here are reported to be equally effective with other synthetic, fire-resistant fluids such as tricresyl phosphate and Aroclor, which is a chlorinated biphenyl.

RESULTS OF RECLAMATION are graphically illustrated by these two bottles: the one on the right contains dirty fluid, the one on the left is reclaimed fluid.

AUTOMOTIVE die castings, such as horn rings and parking lamp housings, are being die cast in zinc in this plant. Line pressure in machines is kept at 1,000 to 1,100 psi, and fluid is maintained

FILTER is shown, with plant engineer Clay Riley, drawing a sample for inspection. Collection pit is in the foreground, first stage of three-stage settling train in the background.

METAL TEMPERATURES are held between 850 and 900 F in the holding pot of these zinc die casting machines. Metal is taken from melting and alloying furnaces in an overhead trolley ladle.

week compared with four drums a week the previous year.

Here is how the record looks on a per machine basis for the two periods: About 1,781 gallons of new fluid per machine at a cost of appoximately $979 when using oil and 468 gallons at a cost of about $1,500 with Pydraul. The result is that a fire-resistant fluid priced at about 6½ times the conventional fluid is actually costing less than twice as much.

Hardy's simple reclaiming system consists of collecting trenches and lines leading to a settling and filtering train. The total cost was about $500.

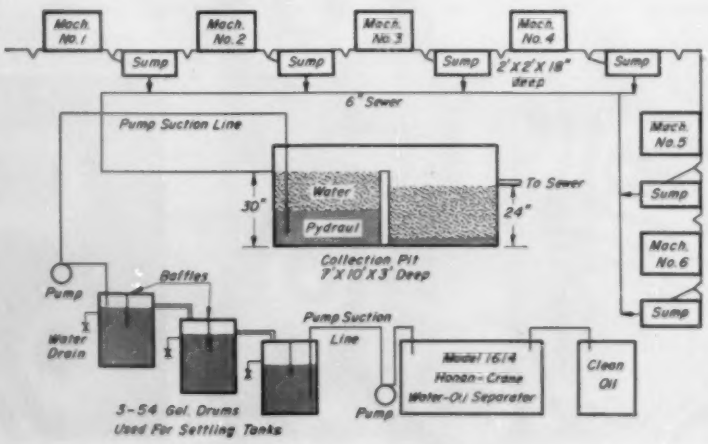
The trenches around the bases of the machines carry spilled cooling water and fluid lost through leaks, line breaks or spills, to one of six sumps from which it flows underground to a 25-barrel collection pit. Here the water and hydraulic fluid are allowed to separate, and the fluid is pumped to a gravity settling train consisting of three 55-gallon drums. A two-stage Model 1614 Honan-Crane filter removes the last traces of impurities and water, and the fluid is ready to re-use.

According to Clay W. Riley, plant engineer, the system will perform even better as leakage is brought under tighter control and reclaiming, already 75 percent efficient, becomes more effective with addition of automatic controls and other improvements.

In addition to its primary justification—the prevention of fire—a fire-resistant fluid often results in other tangible and intangible benefits. As Ben H. Antrobus, die casting supervisor at Hardy says, "Productivity has improved considerably because of fewer interruptions and better morale."

Hardy's experience seems to confirm that where there is a danger of fire — hydraulic fluid under pressure and a source of ignition—the use of a reclaimable fire-resistant fluid is inexpensive insurance.

Simple Reclaiming System That Costs About $500 . . .



SYSTEM FOR RECLAIMING fire-resistant hydraulic fluid at the Hardy plant is diagrammed here. Each machine has a sump which drains into the sewer line, which carries the fluid to remove excess water and then filter out the dirt.

POWDER METALLURGY
continued from page 38

A detailed cost analysis is given below. The cost figures shown are felt to be reliable. Obviously, each producer will have his own standard procedure for calculating costs, and his figures and capacities may differ to some degree from those shown. However, it should be pointed out that these figures show comparisons between different methods of processing so that different procedures used for estimating costs will, to a considerable degree, be minimized.

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(1) A Powder Metallurgy Technique for High Density-High Strength Parts, Mazza, E. N., Precision Metal Molding, July 1954.

(2) High Strength Precision Iron Powder Parts, Doelker, W. J., and Harrison, H. J., Materials and Methods, July 1953.

(3) Pre-alloyed Chromium-Nickel Powders. Metal Hydrides Inc. Beverly, Massachusetts.

(4) Chromium-Nickel Alloy Steel Sinterings: An Investigation of Physical Properties, Shaw, J. D., Knopp, W. V., Gruber, B. A., Precision Metal Molding, March 1953.

(5) Chromium-Nickel Alloy Steel Metal Powder Parts, Gordon, E., Shaw, J. D., Knopp, W. V., Materials and Methods, October 1954.

FEDERATED METALS FORMS ALUMINUM DEPARTMENT

Keeping pace with the dynamic growth of aluminum in industry, Federated Metals Division, American Smelting and Refining Company, New York, has established a national Aluminum Department, according to E. L. Newhouse, Jr., vice president. This important organizational change unifies Federated's nationwide aluminum operations.

Allan Nichamin, active for more than 27 years in the aluminum smelting field and formerly manager of Federated's aluminum producing plant in Detroit will manage the new Aluminum Department. Mr. Nichamin's office will be located in Detroit.

Donald L. LaVelle, formerly research metallurgist in the AS&R central research laboratory, has been appointed assistant manager, and will be located at the company's Perth Amboy, N. J., plant.

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NEW!

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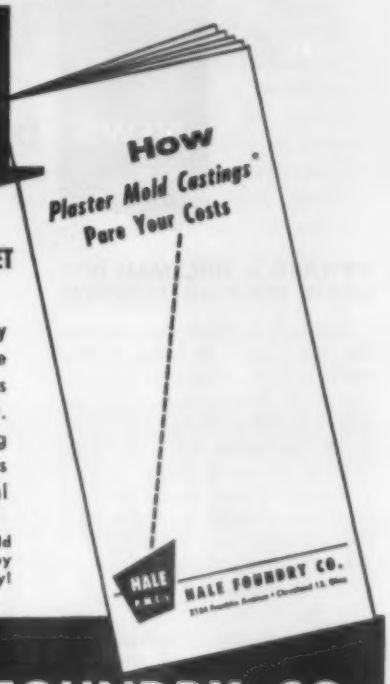
A 12-pager; pocket-sized; printed in bold type for easy reading. Write for your copy on your company letterhead — today!



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NEWS OF INDUSTRY AND ASSOCIATIONS

EDWARD J. HULTMAN DIES; LEWIS WELDING ENGINEER

Edward J. Hultman, engineer for the Lewis Welding & Engineering Corp., Bedford, Ohio, died suddenly February 9 while on a business trip to Flint, Mich.

Mr. Hultman, who has represented Lewis Welding & Engineering for many years, was well-known in the die casting industry, having been a member of the Society of Die Casting Engineers.

Mr. Hultman was born in Grand Rapids, Mich., and spent several years in Mansfield, Ohio, before moving to Cleveland. He is survived by his wife and three children.

SPECTROGRAPHERS TO MEET

The American Association of Spectrographers is planning its 6th Annual Conference in Chicago, Illinois May 6, 1955, on the subject "Industrial Applications of Spectroscopy".

ALUMINUM INDUSTRY LOOKS TO NEW PRODUCTION RECORDS IN '55

Members of The Aluminum Association closed their three-day annual meeting late in January with the general feeling that 1954's record production would be exceeded this year.

Considering the recent ODM announcement that stockpiling may be lower in 1955 than in 1954, the aluminum industry representatives were impressed with the picture that domestic supplies of the lightweight metal would be adequate for both civilian and government needs. They pointed to indicated expansion of domestic primary production; a prospect of increased scrap recovery; and the sharp fall-off in net imports in 1954 from 1953 figures.

U.S. primary production in 1954 totaled 1,461,000 tons and net imports (imports less exports) amounted to only 193,800 tons versus 337,600 tons in 1953.

At the meeting, which marked the Association's twentieth anniversary, Everett G. Fahlman, Permold Company, Medina, Ohio, was elected president. He succeeds D. A. Rhoades, Kaiser Aluminum & Chemical Corporation, Oakland, Calif., who served as the Association's president for the past two years.

Arthur V. Davis, Aluminum Company of America, New York, was re-elected chairman of the board; Donald M. White was reappointed secretary-treasurer and Mildred I. Golden, assistant treasurer.

S. D. Den Uyl, Bohn Aluminum & Brass Corporation, Detroit, Mich., and outgoing president D. A. Rhoades were elected directors at large to serve three-year terms and W. A. Singer, Apex Smelting Company, Chicago, Ill., was re-elected to serve three years.

The following vice-presidents were elected: L. M. Brile, Fairmont Aluminum Company, Fairmont, West Virginia; Frank B. Cuff, Aluminum Company of America, New York; and George N. Wright, Harsch Bronze & Aluminum Foundry, Cleveland.

In the Foundry Division of the association; J. Frank Seeley, Bohn Aluminum & Brass Corporation, Detroit, Mich., was elected chairman and O. L. Earl, Acme Aluminum Foundry Company, Chicago, Ill., vice chairman; E. G. Fahlman was re-elected division representative on the board of directors. Donald M. White was renamed treasurer of this division.

MONARCH NAMES R. A. LAWSON VICE PRESIDENT

Raymond Deutsch, president, Monarch Aluminum Mfg. Company, Cleveland 2, Ohio has announced the election of Russell A. Lawson as vice president, in charge of sales.

This action was taken by the board of directors because of the expanding volume of business now derived from the production of commercial aluminum permanent mold castings, zinc die castings and aluminum die castings.

Mr. Lawson, formerly sales manager of Commercial Castings Division, came with Monarch Aluminum Mfg. Co. during 1945, from Wright Aeronautical, Paterson, N. J. where he had been employed as a development engineer. Under his supervision Monarch operations have been widely diversified into the commercial casting field.

Russell A. Lawson

This year Monarch advertising, under the direction of Mr. Lawson, won the National Direct Mail Advertising Association Award and the Cleveland Advertising Club Performance Award.

BONE EXPANDS PLANT FOR INVESTMENT CASTING

Since acquiring its investment casting department over a year ago, production at Bone Engineering Corp. has grown to the extent that increased facilities have been necessary.

Bone recently added 21,000 square feet adjacent to its main plant on West Broadway in Glendale, making a total of 50,000 square feet.

NEW PLANT PRODUCES MASTER STAINLESS ALLOYS FOR INVESTMENT CASTING

A new plant developed to produce master stainless remelt alloys of the type used by the investment casting industry has been established in Detroit by the Michigan Steel Casting Company with engineering assistance of WaiMet Engineering Co. of Muskegon, Mich.

This plant utilizes large induction melting furnaces to produce metals with maximum characteristics for accurately remelting by the investment casting foundry. For instance, the newest techniques for controlling gas content in the master metal as well as inhibitors to reduce gas pick-up during the remelting operations are employed.

As outlined by Roger Waindle, president of WaiMet, the plant was built in recognition of, 1) the growing need for stainless and "super" stainless alloys for investment casting; 2) the closer metallurgical control required by the high quality of the investment casting to meet the increasingly exacting demands of the design engineers, and, 3) the contribution that Michigan Steel field by pooling their specialized experience in the field of close-tolerance nickel chromium alloys.

The new plant is a complete integration of large arc-melting facilities for primary refining and production induction melting furnaces to produce the metal, new shotting and molding methods to produce the three shapes — ingot, slug and shot. After laboratory approval in chemical and physical laboratories on the premises, the material is cleansed.

Both Michigan Steel, through its former close relationship with Misco Precision Casting Co. and WaiMet, have a continuing, intimate knowledge of investment casting, particularly from the standpoint of metallurgy.

WaiMet, with headquarters at the Michigan Steel Casting Co., 1999 Guoin Street, Detroit, is responsible for distribution and technical service throughout the United States and Canada.

VASCOLOY-RAMET ORGANIZATION CHANGES

Herbert B. Clark, who has been president and general manager of Vascoloy-Ramet Corporation, has been appointed executive vice president of Fansteel Metallurgical Corp. and its subsidiaries, Vas-coloy-Ramet, WW Alloys, Inc. and Tantalum Defense Corp.

Mr. Clark has been associated with Fansteel and Vascoloy-Ramet since 1939. He has been a Fansteel director since 1951.

PRODUCE CARBIDE TOOLS FOR POWDER METALLURGY

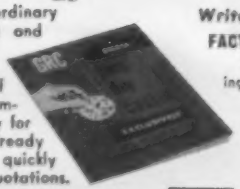
The Valley Tool & Machine Co. at 140 Little Street in Belleville, N.J., has announced the expansion of its facilities to better serve manufacturers of powdered metal parts with quick delivery on carbide die work. Valley Tool is prepared now to make complete punch and die sets or just dies.

Valley Tool & Machine, for years has been producing tableting tools for the ceramic industry.

here's how BIG INDUSTRIES SAVE on SMALL PARTS

GRIES DIE CASTINGS CAN SOLVE YOUR SMALL PARTS PROBLEMS TOO—IN ONE OPERATION!

GRC zinc alloy die castings open extraordinary possibilities for new designs, products and economies, by producing the most intricate tiny parts in one high-speed operation. Gries offers fast delivery of 100,000 pieces to many millions on completely finished small parts. Write today for bulletin and samples — GRC may already have your problem solved or can solve it quickly and economically. Send prints for quotations.



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Max. Wt. ½ oz.
Max. Lgth. 1⅜"

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- Magnesium
- Zinc

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If you want to get a glimpse of our facilities, and some of the castings Paramount is producing, send for this free brochure. It's yours for the asking.

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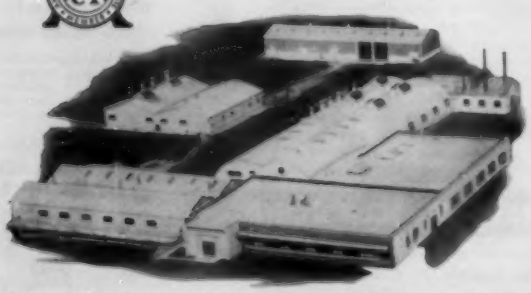
St. Joseph 5, Michigan



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Bright Zinc Plating: **184**
A new bright zinc electro-plating process has been developed specifically for use in barrel plating. Complete data and instructions for use of the process are contained in Technical Bulletin P-130 from Frederic B. Stevens, Inc.

Metal Protection & Paint Bonding: **185**
A new brochure has been issued by the American Chemical Paint Co. listing and describing the proper materials and processes for metal protection and paint bonding on a variety of metals.

Pre-Cleaning in Barrels: **186**
A variation of the dip process for pre-cleaning has been developed for use in tumbling barrels. A complete description of the materials and methods is contained in literature available from Magnus Chemical Co., Inc.

Thread Cutting & Tapping Screws: **187**
Six types of thread cutting and tapping screws for fastening every type of die cast assembly are presented in data sheets from Central Screw Co.

Multi-Color Finish In One Spraycoat: **188**
Free color chips are offered by Maas & Waldstein, along with application data, to introduce their Plextone multi-colored finish that is applied with a single spraying operation using only one gun.

Peelable Plastic Coating For Castings: **189**
The use of butyrate peelable plastic as a coating for precision parts that have super-finished surfaces that need protection, or for "packaging" tools, gages, etc., is the subject of a new booklet from Eastman Chemical Products, Inc.

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LUBRICANTS FOR FORGING AND DIE CASTING

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No. 514 A HOT DIE LUBRICANT is a graphited product for use at temperatures to 2200° F. and over. It prevents hot metal from seizing dies or punches. Produces excellent finish with reduced smoking.

No. 231 DIE CASTING COMPOUND produces fine zinc and aluminum Die Castings. Does not fume, flash or give off offensive odors. Reduces soldering and carbon formation. Minimum gas formation results in stronger castings.

Information on each of the many Fiske Lubricating Specialties is available in bulletin form. Send for bulletins describing lubricants of interest to you.

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Newark 5, N. J. and Toledo 5, Ohio
METAL WORKING LUBRICANTS

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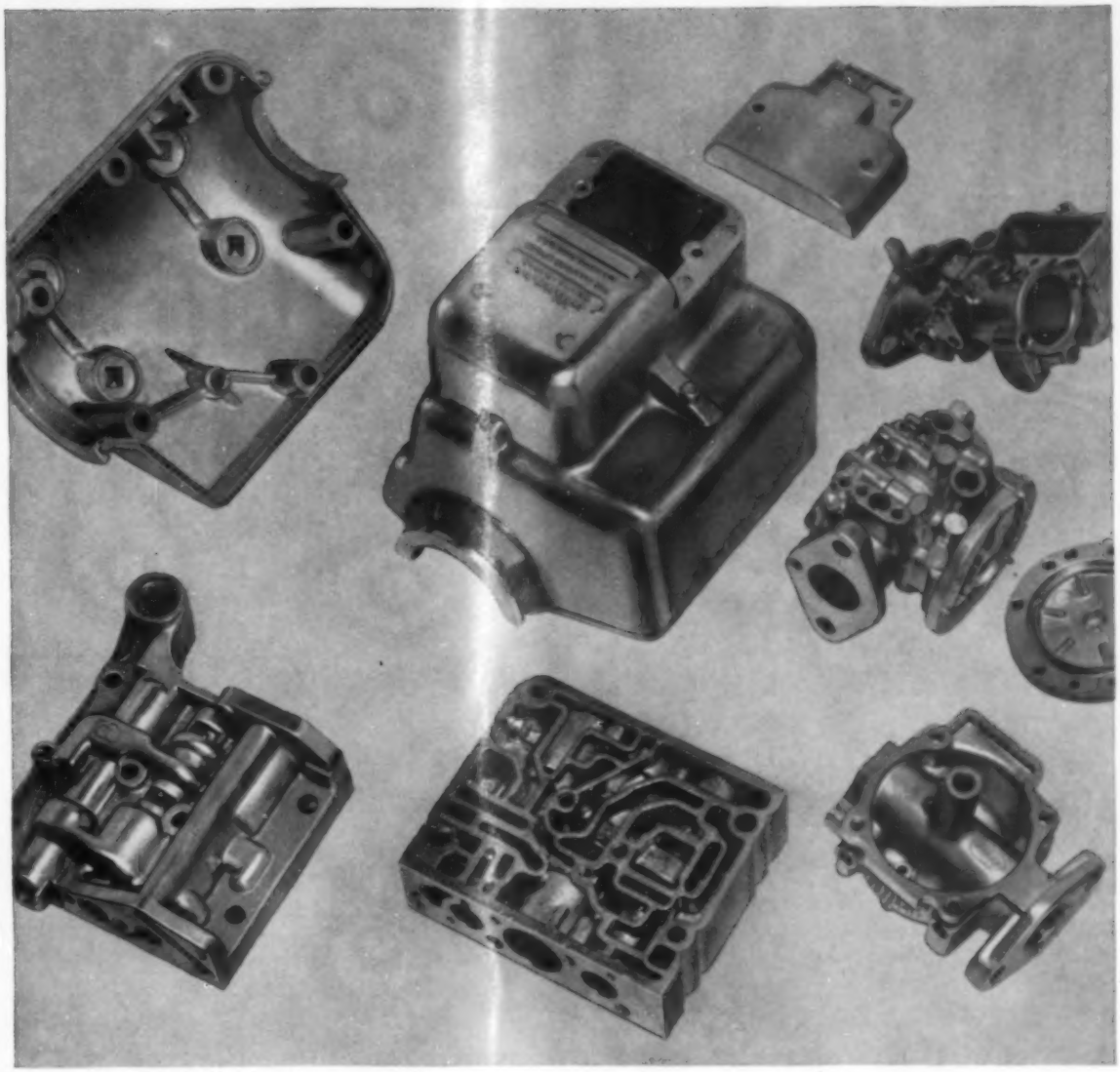

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